THE IRON TRADE REVIEW

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INCREASED INQUIRY

SHOWS QUICKENED INTEREST IN PIG IRON,

But Actual Business is Not Heavy—Numerous Contracts for Structural Material.

A distinctly better feeling has come with the disappearance of the extremely cold weather, which has been an important factor in decreasing the volume of business in a number of lines, particularly structural material. Opinions differ as to how soon active buying will be resumed, some believing that it will not be until April 1, but the volume of pig iron inquiries now being received indicates that large orders may soon be placed. There has been some speculation as to the probable effect of a coal strike on the iron industry, if there should be a general suspension at the bituminous coal mines April 1, but it is not expected that many iron plants will be embarrassed unless the strike should be greatly prolonged.

Pig Iron Conditions

In eastern territory, the principal buying of the week has been by the cast iron pipe interests, which have placed orders for about 25,000 tons of pig iron, of which all but 4,000 tons were southern. A leading pipe interest in Philadelphia is inquiring for 5,000 tons additional, and the principal pump interest has appeared with another inquiry for 5,000 tons of foundry iron. In the Pittsburg district, the Westinghouse Electric & Mfg. Co. is inquiring for 15,000 tons of foundry iron, of which about 10,000 tons will be for the Cleveland plant, and the remainder for the Allegheny plant. In steel making irons, the principal transactions have been in Pittsburg, where from 15,000 to 20,000 tons of Bessemer have changed hands, and St. Louis, where 5,000 tons of basic has been purchased, and where it is expected more will be booked at an early date. At Pittsburg, inquiries amounting to 15,000 tons of basic are pending, and early sales are expected definitely to fix the price, which has been somewhat uncertain.

Finished Materials

The demand for blue annealed sheets is extremely strong, but on other kinds there has been some slackness and also a little shading of prices. Bar iron continues dull. Specifications against contracts have not been coming in very rapidly and some of the mills are almost at the point of shutting down. An order for 1,000 tons from the Merchants' Despatch Transportation Co., Rochester, went to a Cleveland interest at a low price. The same transportation company has placed an order for 15,000 tons of plates and shapes with the Lackawanna Steel Co. The plate market is firm, but there is some shading of quotations on structural material, a few eastern Pennsylvania mills being very aggressive in taking orders. A new bridge to be built across the Allegheny at the Point district, Pittsburg, will require 8,000 tons. Bridge work of the New Haven railroad at Worcester, Mass., calls for 3,500 tons. Among important projects in sight are the Otis bank, Chicago, 6,000 tons, and the Rector Hotel, New York, 2,000 tons. On the latter, the general contract has been awarded. Chicago structural contracts this week amount to 4,000 tons. The final appearance of the Southern Railroad with an inquiry for 3,000 steel gondolas and 600 steel hoppers, which had been expected for some time, is one of the most encouraging signs of greater activity among the railroads in placing orders. An important inquiry for coaches comes from the Harriman lines for 264 cars, of which 235 are of all-steel construction. The Rock Island has ordered 825 box cars with steel underframes, from the Western Car & Foundry Co. The Chicago & Northwestern is inquiring for 200 box cars. Rail orders of the week include 16,000 for the states and 10,000 for Alaska.

Cast Iron Pipe

On the 3,400 tons of cast iron pipe for the city of Cleveland, the lowest bidder was the leading interest, which has just taken contracts for 500 tons for Dayton, O., and for a year's requirements for Salt Lake City. Hartford will close for 4,000 tons on March 9.

Coke and Old Material

The coke market is somewhat improved as to prices, and there is more inquiry, but actual new business is not heavy. The production of the Connellsville region is curtailed 15 per cent this week, compared with 20 per cent last week. The old material market continues quiet in most districts. In the Philadelphia market a leading member of the associated buyers is showing considerable independence in placing contracts without co-operating with the other members.

BASIC INQUIRIES

Form a Fair Total—Bessemer and Basic Average for Last Month.

Pittsburg, March 2. (By wire.)

It is estimated that inquiries outstanding in the Pittsburg territory will approximate 15,000 tons of basic, and it is expected that one or two large sales, involving enough tonnage to establish a definite market price, will be closed before the end of the week. Open inquiries for Bessemer call for about 5,000 tons, although a much larger inquiry is expected to develop in a day or so.

The average monthly pig iron prices, as announced for February, show the average on Bessemer to be $18.06, or $18.96, Pittsburg, as against $19, valley, for January. The basic average for February was $16.31, valley, or $17.21, Pittsburg, as against $16.875, valley, or $17.775, Pittsburg, for the preceding month.

THE WEEK IN IRON CENTERS

PITTSBURG.

Pig Iron Improves and Conditions in General are Better.

Office of THE IRON TRADE REVIEW,
510 Park Building, Mar. 1.

Pronounced improvement in practically every branch of the iron and steel industry is noted this week. The February record in many respects shows a gain over the initial month and indications at the opening of the third month point to a still greater increase in March. There is a decidedly optimistic feeling in all lines and greater activity is expected to follow a change in weather conditions. During the first week of February, there was a slight falling off in new business and specifications in some lines, but greater activity was shown during the closing week than at any time since Jan. 1.

Rail specifications during the month just closed were heavier than in January. The volume of new tonnage booked was also larger, lumber interests entering the market for fairly good tonnage. Makers of steel bars have been unable to make any improvement in promised deliveries owing to the new business coming out and the heavy specifying against contracts. Demand for bar iron is not quite so heavy, although some large contracts are expected shortly.

In the semi-finished lines, little new tonnage is being booked on account of the sold-up condition of the plants. There is a good demand for sheet bars for second half delivery, but makers are not ready to open their books for this period. Hardware dealers have returned from state conventions and are arranging to cover for the season's requirements. There is a large volume of new business in plates in sight, although new bookings at present are not particularly heavy. Despite rumors of price concessions on sheets, market quotations generally are being maintained and premiums are still being paid in some cases. Heavy shipments of pipe are now being made to the west and southwest and the outlook for this department is considered promising.

There is a much better feeling as respects the pig iron market. Sales of Bessemer aggregating about 20,000 tons are noted, and a local interest has entered the market for 15,000 tons of foundry pig iron. A sale of 4,000 tons of foundry iron is also noted. The coke market is also showing a firmer tone and curtailment of production in the Connellsville region this week is not so great as in February.

Pig Iron.—Sales of approximately 20,000 tons of Bessemer pig iron and the inquiry of the Westinghouse Electric & Mfg. Co. for 15,000 tons of foundry pig iron are the leading features of the market this week, which is showing a decidedly stronger tone. The Bessemer iron was sold to two consumers who quietly entered the market a few days ago. While conditions surrounding the sale of part of the iron are rather unusual, the price paid was approximately $18, valley, and this figure is said to represent the general market level. Delivery in both cases is to start immediately.

A few scattered sales of basic pig iron in small lots are noted and as a result practically all of the speculative iron bought last June at about $14 has been disposed of. One local consumer bought 400 tons of this iron, another bought three lots aggregating about 1,800 tons, and another bought about 900 tons. While there have been no large sales to test the market, furnace interests continue to quote $16.50, valley.

The Westinghouse Electric & Mfg. Co.'s inquiry calls for 6,000 tons of No. 2, 6,000 tons of No. 3 and 3,000 tons of No. 1 foundry for second half delivery. Of this amount, 10,000 tons will go to the Cleveland plant and the remainder to the Allegheny works. Bids must be submitted on or before March 4. This is the largest inquiry for foundry pig iron in this district in several months. In addition to this the National Radiator Co., Johnstown, Pa., has bought 4,000 tons and the Union Radiator Co., Johnstown, has bought 1,000 tons. The International Steam Pump Co. has entered the market for an additional 5,000 tons. The general asking price of foundry iron is $16.50, although this figure is known to have been shaded.

There is little demand for malleable pig iron in this market, only a few scattered sales of small lots being made.

Pig Iron Prices.

(Prompt Shipment.)

Bessemer, valley	$18.00
Bessemer, Pittsburg	18.90
Basic, valley	16.50
Basic, Pittsburg	17.40
No. 2 foundry, Pittsburg	17.40
Gray forge, Pittsburg	16.90
Malleable, Pittsburg	17.15

(First Quarter.)

Bessemer, valley	18.00
Bessemer, Pittsburg	18.90
Basic, valley	16.50
Basic, Pittsburg	17.40
No. 2 foundry, Pittsburg	17.40
Gray forge, Pittsburg	16.90
Malleable, Pittsburg	17.15

Ferro-Alloys.—Demand for ferro-alloys continues light and only a few scattered sales in carload lots are reported. A few carload lots of ferro-manganese have been sold on a basis of $43.50 to $44, Baltimore, for prompt. Several inquiries for 50 per cent ferro-silicon are noted, but few sales are reported.

We quote ferro-manganese at $43.50 to $44, Baltimore, for immediate shipment or for first half, and from $44 to $44.50 for second half. The freight rate from Baltimore to Pittsburg is $2.30 per ton.

Fifty per cent ferro-silicon is quoted at $62.50 to $63.50, Pittsburg; domestic 12 per cent, $25.90; 11 per cent, $24.90; 10 per cent, $23.90, Pittsburg, for prompt, first quarter, and $1 advance for second quarter. The foreign grades are held at $1 or more a ton over domestic prices.

Plates.—Specifications against contracts for plates are satisfactory, although there appears to have been a slight falling off in new tonnage. The volume of business booked is slightly below that of January. Heavy tonnage is involved in new work to be taken up shortly and it is expected that some large orders will be booked in the near future. Current quotations are being maintained, and 1.50c is regarded as the minimum. Makers of plates have been informed that some fairly large orders for cars will be placed within the next 30 days and with the opening of spring weather the outlook for this branch is considered promising. We quote the market as follows:

Tank plates, ¼ inch thick, 6¼ to 100 inches, 1.55c to 1.60c. Extras are as follows, per 100 pounds: Boiler and flange steel plates, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.20c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½ inch to and includ-

ing 3-16 inch plate on thin edge, 0.10c; under 3-16 inch and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Sheets.—One or two independent makers are known to have shaded current quotations on sheets slightly during the last week. It is also known that a consumer paid a premium of $7 on sheets for prompt shipment. This market, taken as a whole, is satisfactory to makers, specifications being as heavy as at any time since Jan. 1. Most makers are unable to take any additional tonnage for first half delivery, and the shading of prices has not in any way affected market conditions. Heavy shipments on sheets are now being made to points in the southwest for roofing purposes. Present sheet prices, Pittsburg base, are as follows, with $1 a ton added as the delivered price in the Pittsburg district:

Blue annealed sheets, Nos. 3 to 8, 1.70c; Nos. 9 and 10, 1.75c; Nos. 11 and 12, 1.80c; Nos. 13 and 14, 1.85c; Nos. 15 and 16, 1.95c; box annealed sheets, Nos. 10 and 12, 2.05c; Nos. 13 and 14, 2.10c; Nos. 15 and 16, 2.15c; Nos. 17 to 21, 2.20c; Nos. 22 to 24, 2.25c; Nos. 25 and 26, 2.30c; Nos. 27, 2.35c; No. 28, 2.40c; No. 29, 2.45c; No. 30, 2.55c; galvanized sheets, Nos. 12 to 14, 2.50c to 2.55c; Nos. 15 and 16, 2.60c to 2.65c; Nos. 17 to 21, 2.75c; Nos. 22 to 24, 2.90c; Nos. 25 and 26, 3.10c; No. 27, 3.30c; No. 28, 3.50c; No. 29, 3.60c; No. 30, 3.85c; painted roofing sheets, $1.70 per square for No. 28 gage, 2½-inch corrugation, and galvanized roofing sheets, $3 per square for No. 28 gage, 2½-inch corrugation.

Tin Plate.—Little change is noted in the tin plate market this week. Makers who are in a position to accept new tonnage are having no trouble in finding it, and specifications continue heavy. Only a few of the makers are in a position to take new business for delivery before the latter part of May, while others have enough tonnage on their books to keep their plants running to capacity until July or August. There has been no change in mill operations during the last week. The base price in tin plate, over which some premiums have been paid for desirable business, is as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.60, f. o. b. mill, Pittsburg district.

Rails and Track Material.—The rail market during the month of February made a much better showing than in January, both in the volume of new business booked and in specifications, notwithstanding that February was a shorter month. The first week in February showed a slight increase over the last week in January, and each succeeding week showed a substantial gain. One of the encouraging features of this market is the fact that lumber interests are buying freely. While the heavier tonnage has not been sufficiently large to necessitate the operation of additional mills, the market taken as a whole is stronger than at any time this year. Demand for light rails is gradually increasing. In addition to the several thousand tons of standards in small lots being entered weekly, the leading interest shows a slight gain in light rail bookings over the previous week. The demand for track bolts is quite heavy. The Louisville & Nashville railroad has placed an order for 7,000 kegs of track bolts, and several other orders are pending. We quote standard Bessemer rails as follows, the base price for open-hearth rails being $30, mill:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; light rails on base weight of 40 to 45 pounds, $28, the schedule on the other weights being irrgular and subject to negotiations; angle splice bars for standard sections, 1.50c, Pittsburg; standard spikes, 1.75c to 1.80c, Pittsburg; hand spikes, 1.80c to 1.85c, Pittsburg; track bolts, 2.50c, Pittsburg.

Steel.—Little change is noticed in conditions surrounding the semi-finished steel market. Owing to the fact that makers are not in a position to accept much tonnage in this line and users appear to be well covered, very few sales are being made. Open-hearth billets are as scarce as ever, although a few sales of Bessemer billets in small lots are reported. Small lots of Bessemer sheet bars have also been sold on a basis of from $28.50 to $29, at makers' mill. Inquiries involving large tonnage for last half delivery are noted, but makers have not decided when books will be opened for delivery beyond July 1.

Bessemer 4 x 4 billets with 0.25 carbon and less are quoted at $27.50 to $28, Pittsburg, with the usual extras for size and anlysis, and open-hearth rolling billets from $30 to $31, Pittsburg. Forging billets are quotable at $32 to $33, Pittsburg. Sheet and tin bars are quoted at $28.50 to $29.00 at makers' mill, located within the $1, Pittsburg, freight limits.

Hoops and Bands.—New business in hoops and bands is a little heavier than last week. Specifications continue heavy and rumors of price concessions have entirely disappeared, the 1.60c base price being regarded as the minimum. We quote the present market as follows:

Hoops in carload lots, 1.60c to 1.65c; in less than carload lots, 1.70c to 1.75c; bands, 1.50c to 1.55c, base, with net extras as per standard steel.

Merchant Bars.—Makers of steel bars report that they have been unable to make any improvements in deliveries on account of the new business coming in and the manner in which consumers are specifying. The steel bar market is showing a firmer tone and the outlook is considered promising. Contrary to expectation, the railroads have not started on their spring buying, and as a result the bar iron market is not so active as last week. In a few instances, mill operations have been affected by the falling off in new business and specifications, although prices remain firm. Shafting business continues firm. We quote the market as follows:

Common iron bars, 1.70c to 1.75c, Pittsburg; Bessemer and open-hearth steel bars, 1.45c to 1.50c; plow and cultivator, 1.45c to 1.50c; channels, angles, zees, tees, under 3-inch, 1.45c to 1.50c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds, 0.15c advance; less than 1,000 pounds of a size, 0.35c advance. Cold rolled and ground shafting, 55 per cent in carloads and 50 per cent in less than carloads, delivered in base territory.

Planished and machine straightened tire is 1.70c base; iron finished tire under 1½ by 1½ inches, 1.65c, both plus net extra on tire card; iron finished tire, 1½ by ½ and over, 1.50c, plus net extra on the steel bar card.

On cold rolled strip steel, with 1½ inches and wider, and 0.100-inch and thicker, we quote base prices for 100 pounds, $3.35 on hard, and $3.60 on soft, except in carload lots of one size, where the price is lower.

Structural Material. — Unfavorable weather conditions are responsible for the vast amount of structural work being held up. Architects and prospective builders are about ready to invite bids for several new buildings which will involve fairly heavy tonnage of structural steel. The War department has approved plans for the $1,000,000 bridge to be built across the Allegheny river in the Point district, Pittsburg, which will require about 8,000 tons of steel. It is expected that contracts for the masonry and sub-structure will be awarded in the very near future. The general contract for the new Eighteenth regimental armory, Pittsburg, has been awarded. The new structure will require about 500 tons of structural material, and it is expected that this order will be placed next week. Contracts for steel to be used in three or four proposed bridges and several other projects will be awarded as soon as

weather conditions permit actual construction to be started.

Beams and channels, 15-inch and under, 1.55c to 1.60c; over 15 inches, 1.65c to 1.70c; zees, 1.55c to 1.60c; tees, 1.55c to 1.60c; angles, from 3 to 6 inches, 1.55c to 1.60c; over 6 inches, 1.55c to 1.70c; universal and sheared plates, 6¼ inches wide and wider, 1.55c to 1.60c.

Merchant Pipe.—Weather conditions are said to be responsible for the light buying of tubular goods at present. Many of the contracts which were to have been awarded early in February are still being held up. Local makers report that heavy shipments are being made to the west and southwest on big contracts placed some time ago. Other users who covered for their requirements some months ago are asking that delivery be made early in March. Notwithstanding that there appears to be a slight falling off in new tonnage, makers report that market conditions generally are satisfactory, and that they have enough business on their books to assure steady operation of their plants for some time. We quote the following official discounts in carload lots, subject to the usual discount to the largest buyers, merchant pipe, where specified, being furnished in from ⅛ to 6 inches, and in plugged and reamed lots:

	—Steel—		—Iron—	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch	70	54	65	..
⅜ inch	71	57	66	52
½ inch	74	62	69	57
⅝ to 6 inch	78	68	73	63
7 to 12 inch	72	57	67	52
13 to 15 inch	51½	..	..	..
PLUGGED AND REAMED.				
1 to 4 inch	76	66	71	61
EXTRA STRONG PLAIN ENDS.				
⅛ to ⅜ inch	63	51	58	46
½ to 4 inch	70	58	65	53
4½ to 8 inch	66	54	61	49
9, 10, 11 and 12 inch	59	47	54	42
DOUBLE EXTRA STRONG PLAIN ENDS				
½ to 8 inch	59	48	54	43

Boiler Tubes.—Specifications against contracts for boiler tubes continue satisfactory to makers, and there is a fair amount of new business being booked. Conditions surrounding this market show little change during the month, except perhaps that deliveries are a little easier.

	Steel.	Iron.
1 to 1½ inch	49	43
1¾ to 1¼ inch	61	43
2½ inch	63	48
2¾ to 5 inch	69	55
6 to 13 inch	60	43

2½ inch and smaller, over 18 feet, 10 per cent net extra.

2¾ inch and larger, over 22 feet, 10 per cent net extra.

To destinations east of the Mississippi river will be sold at delivered discount for carloads lowered by two points, for lengths 22 feet and under; longer lengths, f. o. b. Pittsburg.

Wire Products.—While local buyers are still holding back in their spring buying, makers report that there is a heavier demand from other districts. Weather conditions are said to be directly responsible for the delay in spring buying in the immediate Pittsburg district, jobbers not being willing to increase their stocks on account of the threatened floods. Hardware dealers are returning from the annual conventions of the state hardware dealers' associations, and makers generally are expecting a buying movement within the next week. The wire market is thought to be a little stronger than a week or so ago and there is less talk of price concessions. We quote the market as follows, contracts for the jobbing trade being limited usually to 60 days:

Wire nails, jobbers' carload lots, $1.85; retailers' carload lots, $1.90; painted barb wire, jobbers' carload lots, $1.85; retailers' carload lots, $1.90; with 30c for galvanizing; plain wire to jobbers in carloads, $1.65, and to dealers, in carloads, $1.70; polished staples, $1.85; galvanized staples, $2.15.

Wire Rods.—Little change is noted in the wire rod market this week. There is little new business being entered, although consumers continue to specify in a satisfactory manner. Mill operations are unchanged. We quote the market at $33 and $34, Pittsburg, on Bessemer and open-hearth rods.

Coke.—The coke market appears to be showing a much firmer tone this week. While there has been no general advance in prices, some of the independents who were making unusually low quotations a week ago are now asking slightly higher prices. Production in the Connellsville district is being curtailed only 15 per cent instead of 20 per cent this week. There appears to be fairly good inquiry for both furnace and foundry grades. Many of the inquiries are for March and April delivery, and this is said to be due entirely to the failure of coal operators and miners to agree upon a wage scale and working conditions for the coming year. It is generally believed here that there will be a suspension of mining operations, beginning April 1, for a few weeks, at least. Some of the consumers are showing a disposition to contract for their requirements during the last half of the year, and it is believed that some large contracts will be announced shortly. The committee appointed about ten days ago to secure signatures of independent producers of standard Connellsville coke to an agreement for the formation of a general selling agency announces that it will be in a position to make its report early next week. We quote standard Connellsville furnace coke for prompt shipment at from $2.25 to $2.35, ovens, and on contract from $2.30 to $2.40, ovens, although it is known that sales have been made at lower figures. On high grade Connellsville foundry coke, we quote from $2.90 to $3, ovens, for prompt delivery. On contracts, we quote from $2.95 to $3.10. The Connellsville *Courier's* figures for the week ending Feb. 19, show 36,645 ovens active with an output of 463,123 tons, compared with 36,653 active ovens and a production of 466,344 tons the previous week.

Old Material.—The old material market is quiet. While few sales are being made, there appears to be a little more inquiry for some grades. Producers are not offering quite as much material to dealers, who now have large stocks on hand. There is no indication as yet that dealers can expect a buying movement in the near future, although consumption continues heavy and some of the stocks at furnaces are gradually being depleted. Aside from the carload lots contracted for some months ago, which users are obliged to move, there is little scrap changing hands at present. The price of low phosphorus has been reduced 50 cents, the new quotation being $21 to $21.50. Machine shop turnings can now be had at from $11.75 to $12.25, a reduction of 50 cents. Quotations on No. 1 cast scrap have been lowered 25 cents. While prices of heavy melting scrap, re-rolling rails and No. 1 wrought scrap have not been changed, there appears to be little demand for these grades. We quote, gross tons, delivered in the Pittsburg district, including Monessen, Sharon, Steubenville, Brackenridge and Follansbee, as follows:

Heavy melting scrap	$16.75 to 17.25
Rerolling rails	17.50 to 18.00
Bundled sheet scrap	14.75 to 15.25
Iron axles	26.50 to 27.00
Old iron rails	18.00 to 18.50
No. 1 wrought scrap	18.00 to 18.50
Old car wheels	17.00 to 17.50
Low phosphorus	20.50 to 21.00
Machine shop turnings	11.75 to 12.25
Cast borings	9.50 to 10.00
No. 1 cast scrap	16.25 to 16.75
Malleable	16.00 to 16.50
Stove plate	12.50 to 13.00

Walter-Wallingford & Co., brokers, pig iron, coke and alloys, who, until recently, occupied offices in the Peoples Bank Bldg., Pittsburg, have removed to a suite in the Farmers' Bank building, Pittsburg, Nos. 2216-16-A.

TOLEDO PLANT BOUGHT.

The Bucyrus Steam Shovel Co., of South Milwaukee, through President Howard P. Eells, of Cleveland, and George F. Steedman, president of Curtis & Co. Mfg. Co., of St. Louis, has purchased the plant of the Vulcan Steam Shovel Co., at Toledo. It is understood that the price paid for the Vulcan plant was about $500,000.

CHICAGO.

Decided Improvements in Tone—Many Structural Contracts Awarded.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, Mar. 1.

Coincidental with the approach of spring, and possibly tracing up to that event in the rotation of the season its cause, there is beginning to be felt a better tone in the iron and steel market, and those who have been persistent optimists are even more strongly so, and some of the opposite faith, or lack of faith, are beginning to view the outlook through glasses that are more nearly rose-colored. It has been difficult for one who watches the market closely, to figure out any legitimate reason for the weakness which has prevailed in some quarters for a few weeks. If there has been an attempt made by powerful financial interests to have a try-out with the administration, as there was with the previous administration, in 1907, its only effect has been to unsettle industrial matters somewhat, by shaking the confidence of a portion of the manufacturing world who lacked the nerve to "stand pat" and wait for the next wave of business activity which was and is sure to come. There can be no doubt that conditions are right for a splendid year of prosperous undertakings: one might almost say that everything is "fool-proof" for another twelve months, if not longer. What weakness there has been, was confined to pig iron and scrap material, almost exclusively, and this had its origin in the dumping on the market of a goodly quantity of re-sale foundry iron, from the south, which has been held a long time by speculators. Other lines have enjoyed a very different experience, and the realization is becoming more and more general, that fears of a general slump were anything but well founded. As a result, confidence is returning, and faces are being turned towards the era of prosperity which is just ahead of us, or, in reality, with us, now. Contracting for structural work goes on, and during the past week some 4,000 tons were closed in the Chicago district, with quite a large quantity nearing the contract stage; 10,000 tons of open-hearth rails were sold by the leading interest, through the Chicago office, while other lines of finished product have maintained a fair degree of activity. Already the agricultural implement makers have appeared in the market, with inquiries for material on their contracts which run from July to July, and numerous specifications have been made on second orders on old contracts. Some speculation is being indulged in as to what effect the probable suspension of operations at the soft coal mines, April 1, may have upon the iron works using that class of fuel. It is pointed out that there is little cause for uneasiness, as the mines have accumulated large stocks of coal, and although it might be some time before an agreement with the miners is reached, on the matter of contracts, these stocks would last several weeks, and other districts, running independently of union contracts, could be drawn upon for supplies, so that bar iron mills and other industries need apprehend little inconvenience from short fuel supplies. Store business has been good, the past week, and the month of February, always looked upon as a quiet month, was, in the experience of some of the jobbers, the best February in the history of their business. Prices out of store are being maintained, but machine bolts are a little weak, to the extent that an extra 5 per cent can be secured on large purchases.

Pig Iron.—The week has been almost devoid of transactions, and the tone has been unquestionably weaker, buyers taking advantage of their opportunities to hammer the market whenever an occasion arose for doing so. Prices have yielded somewhat to the pressure, and there are some furnaces which would accept $13, Birmingham, for prompt shipment, on desirable business. This hardly has come to be the market price, yet there has been shown a disposition on the part of some interests to accept the figure mentioned, rather than to let the business get away from them. In spite of the feeling of weakness, the majority of makers and sellers of pig iron are in a hopeful frame of mind, and look for a very decided change in the situation within a comparatively short time. The market seems to be in that condition, so often reached, from which improvement might set in, within a very few hours. Railroads are beginning to buy more freely, and, if this continues, there will be an increased demand for malleable iron and steel castings, and this would have an immediate effect on the pig iron market. In the south, the situation as to production is strong; the Sloss properties are still handicapped from the effects of the floods which put some of the furnaces out of blast and mines out of commission. The Tennessee Coal, Iron & Railroad Co. switched two of its furnaces from foundry to basic iron, last month, and eventually this interest will practically cease to be a producer for foundry irons, so great has become the demand for steel-making irons from its own plants. During the past month, these plants produced something like 43,000 tons of steel. We repeat last week's quotations, with the notation that in the case of No. 2 southern, concessions are being made, as referred to above.

Lake Superior charcoal	$19.00 to 19.50
Northern foundry No. 2	18.50 to 19.00
Southern foundry No. 2	17.85 to 18.35
Southern silveries, 5 per cent silicon	18.90 to 19.40
Jackson Co. silveries, 8 per cent.	22.40 to 22.90
Malleable Bessemer	18.50 to 19.00
Alabama basic	18.35 to 18.85

Billets.—Very little movement has been noted in this market for some time, and the old condition of nominal prices, coupled with the scarcity of steel continues. Occasional orders for small lots are accepted by representatives of eastern mills, but consumers still find much difficulty in securing sufficient quantity to satisfy their requirements.

Merchant Bars.—The demand upon the local mills for bars is very insistent, and order books are well filled with business for some months ahead. Spot delivery is almost impossible, in most cases, and where a mill is in a position to run in a little order, for rolling within a week or ten days, a very good premium is readily obtained.

We quote, for Chicago delivery, as follows:

Bar iron, 1.60c to 1.65c; hard steel bars, re-rolled, 1.60c to 1.65c; soft steel bars and bands and small shapes, 1.68c to 1.78c, base; hoops, 1.78c to 1.88c; planished or smooth finished tire steel, 1.88c to 1.93c; iron finish, up to 1½ by ½ inch, 1.83c base, tire card; iron finish, 1½ by ½ inch and larger, 1.68c, base, bar card; channels for solid rubber tires, ¾ to 1 inch, 2.18c, flat, and 1⅛ inches and larger, 2.08c, flat; smooth finished machinery steel, 1 inch and larger, 2.43c; flat sleigh shoe, 1.73c; toe calk steel, 2.23c; spring steel, 2.28c; crucible spring steel, 2.78c; tool steel, 7c to 9c, with higher prices for special grades. Quotations on shafting are 55 per cent off the list for carload lots, and 50 per cent off for less than carload lots, carload freight allowed to points in base territory.

On iron and steel bars from local stocks, we quote as follows: Bar iron, 2c to 2.10c, base; soft steel bars, 1.90c to 2c per 100 pounds, base; soft steel hoops, 2.40c to 2.50c, full extras.

Structural Material.—The past week has been a very fair one for fabricating interests, and the tonnage booked by sales offices in this territory has been quite large. There is still a large amount of unfinished business in the offices of architects and others, which is expected to be placed in the near future. As stated in this report some weeks ago, there is considerable construction still in abeyance, and recently this has been increased by some 20,000 tons. The Morava Construction Co. has taken the contract for the ad-

dition to the McCormick Works of the International Harvester Co., in this city, requiring 700 tons of steel. The Chicago Bridge & Iron Works has been given 1,000 tons for elevated track work being done in this city by the Chicago Terminal Transfer Co. The American Bridge Co. secured 260 tons for a coal-handling bridge for the Zenith Furnace, at Duluth. A. Bolter's Sons have the contract for 250 tons of steel for the Progress building in this city. The 347 tons of steel for the Sinai Temple, in Chicago, will be fabricated by the Hansell-Elcock Co., of this city. The C., B. & Q. road has contracted for additional track elevation material amounting to 225 tons, which has been given to the McClintic-Marshall Construction Co., and the St. Paul road has given 170 tons to the Wisconsin Bridge & Iron Works for the same purpose. The C. Reiss Coal Co, Sheboygan, Wis., has let the contract for a coal-handling outfit requiring 350 tons of steel to the Modern Steel Structural Co., Waukesha, Wis. The Putnam building, Davenport, Ia., for which D. H. Burnham & Co., of Chicago, were the architects, will require about 1,000 tons of steel, and the same will be fabricated by Vierling, McDowell & Co., this city. Bethlehem shapes have been specified. The contract for 750 tons of steel for Science Hall, at the University of Illinois, Champaign, will be let some time this week. Ralph Modjeski, of Chicago, has prepared plans for a bascule bridge, with a 250-foot opening, to be erected by the city of Portland, Ore. It will cost in the neighborhood of $1,500,000, and the fabricators will be asked for bids as soon as permission to build has been granted by the war department.

We quote mill prices for structural shapes, Chicago delivery, as follows:

Beams and channels, 15-inch and under, 1.78c to 1.88c. For extras see Pittsburg report.

Local store prices are as follows: All angles, 3 inches and larger, including 6 inches, $2 to $2.10 per 100 pounds; angles over 6 inches, $2.10 to $2.20 per 100 pounds, base; beams, 3 to 15 inches, inclusive, $2 per 100 pounds, base; channels, 3 inches and larger, $2 per 100 pounds, base.

Rails and Track Supplies.—There is a good, seasonable demand for track fastenings, but the rail orders taken by the leading interest during the past week, amounted to little more than 10,000 tons, that amount of open-hearth rails having been taken by the Chesapeake & Ohio railroad.

See Pittsburg report for prices on standard sections.

On light rails, Chicago delivery, we quote as follows: Light rails, 40 and 45-pound, $27; 30 and 35-pound, $27.75; 16, 20 and 25-pound, $28; 12-pound, $29.

Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; railroad spikes, 1.85c to 1.95c; smaller size spikes, 1.90c to 2c, base; track bolts with square nuts, 2.40c to 2.60c, base; with hexagon nuts, 2.55c to 2.75c.

Plates.—Mills are receiving heavier specifications than for some time, and the new business being booked is of fair volume. The amount of car building in sight promises a degree of activity in this line which is very encouragng to plate makers.

We quote, Chicago delivery, as follows: Tank plates, ¼ inch thick, 6¼ to 100 inches, 1.78c to 1.88c. For extras see Pittsburg report.

Store quotations are without change as follows: Tank steel, ¼ inch and heavier, up to 72 inches wide, 2c to 2.10c; from 72 inches to 96 inches wide, 2.10c to 2.20c; 3-16 inch up to and including 60 inches wide, 2.10c to 2.20c; 72 inches, 2.35c to 2.45c; No. 8 up to 60 inches wide, 2.15c to 2.25c. Flange and head quality, 25c extra.

Sheets.—Business conditions continue satisfactory with the local sheet mill, which is working on specifications on old orders. New business to an extent which assures steady running of the plant, forms a part of the very favorable outlook for the future, while the maintaining of prices also seems assured.

For mill prices see Pittsburg report. Freight to Chicago, 18 cents.

We quote store prices at Chicago as follows: No. 10, 2.25c to 2.35c; No. 12, 2.30c to 2.40c; No. 14, 2.35c to 2.45c; No. 16, 2.45c to 2.55c; Nos. 18-20, 2.80c to 2.90c; Nos. 22-24, 2.85c to 2.95c; No. 26, 2.90c to 3c; No. 27, 2.95c to 3.05c; No. 28, 3c to 3.10c; No. 30, 3.30c; galvanized sheets, Nos. 10 and 16, 3.20c to 3.30c; Nos. 18 and 20, 3.35c to 3.45c; Nos. 22 to 24, 3.50c to 3.60c; No. 26, 3.50c to 3.80c; No. 27, 3.90c to 4c; No. 28, 4.10c to 4.20c; No. 30, 4.50c to 4.60c.

Wire Products.—Everything looks favorable for a large business in wire goods within the next few weeks. Just at present the worst feature in this line is, as it has been for some time, the difficulty in securing cars for shipment of the orders already on the books. This is proving a source of inconvenience as well to jobbers and the smaller dealers, as to manufacturers. Prices appear steady at former quotations.

We quote, Chicago delivery, as follows: Wire nails, jobbers' carload lots, $2.03; retailers' carload lots, $2.08; retailers' less than carload lots, $2.18; painted barb wire, jobbers' carload lots, $2.03; retailers' carload lots, $2.08; retailers' less than carload lots, $2.18; with 30c for galvanizing; plain wire to jobbers, carload lots, $1.83; staples, bright, $2.03.

Merchant Pipe and Tubes.—Nothing out of the ordinary run of mid-winter trade conditions is reported for the past week. It is a little early to look for much of a revival in this line, although, as soon as weather conditions will permit, a large consumption of tubular material by the building interests is expected.

For mill discounts, see Pittsburg report.

We quote, out of store, as follows: Wrought steel pipe, black, ⅛-inch to ¼-inch, 68 per cent; ⅜-inch, 69 per cent; ½-inch, 72 per cent; ¾-inch to 6-inch, 76 per cent; 7-inch to 12-inch, 68 per cent. Iron pipe, about 6 points higher.

Lap-welded steel tubes, 2¼-inch to 5-inch, 60 to 62 per cent; charcoal iron tubes, 2¼-inch to 4-inch, 48 to 50 per cent, seamless steel tubes, 2¼-inch to 4-inch, 46 per cent.

Cast Iron Pipe.—Very little is doing in this market at the present time, and the prices are nominally unchanged. The Dayton, O., contract of 500 tons went to the United States Cast Iron Pipe & Foundry Co. The Salt Lake City contract for the present year's supply was let to P. J. Moran, of that city. The pipe will be furnished by the leading interest. The city of Cleveland has opened bids for 3,500 tons of pipe.

We quote prices, f. o. b. Chicago, as follows: 4-inch water pipe, $28.50; 6 to 16 inches, $27.50; larger sizes, $26.50; gas pipe, $1 a ton higher.

Old Material.—Very little buying is being done, except in such cases as where a purchasing agent sees what he considers a bargain, and some of these are appearing every now and then, with the result that some mills have been able to keep their stocks well in hand and have not allowed them to run dangerously low. There is scarcely enough business going to establish prices, but the tendency in some of the lines has been toward a slightly lower level. We quite, gross tons, as follows:

quote, gross tons, as follows:

Old car wheels	$17.50 to 18.00
Old iron rails	18.00 to 18.50
Rerolling rails (4 ft. and over)	17.50 to 18.00
Old steel rails (2 ft. and under)	16.50 to 17.00
Light section relayers, 45 lbs. and under, subject to inspection	21.00 to 23.00
Relaying rails, subject to inspection	24.50 to 25.00
Frogs, switches and guards	14.75 to 15.25

Heavy melting steel	14.75 to 15.25
Shoveling steel	14.25 to 14.75

We quote, net tons, as follows:

No. 1 R. R. wrought	$14.25 to 14.75
No. 2 R. R. wrought	13.25 to 13.75
Arch bars and transoms	17.25 to 17.75
Knuckles, couplers and springs	14.00 to 14.50
Shafting	17.50 to 18.00
Iron car axles	21.75 to 22.25
Steel car axles	22.50 to 23.00
Locomotive tires	18.00 to 18.50
Dealers' forge	12.00 to 12.25
Pipes and flues	11.25 to 11.75
No. 1 cast, 150 lbs. and less	14.25 to 14.75
No. 1 busheling	12.00 to 12.50
No. 2 busheling	9.25 to 9.75
No. 1 boiler cut	11.25 to 11.75
Boiler punchings	16.50 to 17.00
Cast and mixed borings	6.75 to 7.25
Machine shop turnings	9.75 to 10.25
Railroad malleable	14.25 to 14.75
Agricultural malleable	12.50 to 13.00
Stove plate and light cast scrap	12.25 to 12.75
Angle bars, splices, etc. (iron)	17.00 to 17.50
Angle bars, steel	14.75 to 15.25

CLEVELAND.

Westinghouse Inquiry May Bring Out Surprising Figures.

Office of THE IRON TRADE REVIEW,
Browning Building, Mar. 1.

Iron Ore.—For the most part, eastern producers are still showing no interest in Lake Superior ores, but two or three inquiries from the east are pending, and it is not at all improbable that more will come later, as the difficulties in getting foreign ore delivered are increasing. There is a fair movement of ore from docks to furnaces at present.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $5.00; Mesabi Bessemer, $4.50; old range non-Bessemer, $4.20; Mesabi non-Bessemer, $4.00.

Pig Iron.—With the exception of the Westinghouse inquiry, the market is exceedingly quiet. It is confidently expected that there will be a scramble for the Westinghouse tonnage, and some low prices will undoubtedly be named. Some furnace interests, while anxious to get their share of the tonnage, will not go below what they consider a reasonable figure, and they are of the opinion that this will be the last low price iron which will be sold for some time. Other selling interests are not so confident that the placing of the Westinghouse tonnage will be followed by higher prices. The market in steel making iron is extremely quiet, but it is hinted that there may be some good Bessemer tonnage before another week passes. An inquiry for between 2,500 and 3,000 tons of basic, delivery May and June, has been received here from a steel concern near Pittsburg. We quote, delivered in Cleveland, as follows:

No. 1 foundry	$17.00 to 17.75
No. 2 foundry	17.25 to 17.50
No. 2 Southern	17.35 to 18.10
Gray forge	17.15
Bessemer	18.90
Lake Superior charcoal	19.50
Jackson Co. 8 per cent silvery	21.55

Coke.—A small quantity of foundry coke has been sold for prompt delivery at $3, but this is the top of the market, and we quote this coke at $2.75 to $3.00 for prompt delivery, and $3 for first half. Furnace coke is a shade firmer, and we quote $2 to $2.25 for prompt delivery, and $2 to $2.50 for first half.

Finished Material.—The insistence of many buyers in getting their materials from jobbers at high quotations is one of the strongest indications of the underlying strength of the market. The demand for blue annealed sheets is very active, and premiums are being paid for prompt delivery. The demand for other sheets is not so strong. Some eastern manufacturers of shapes and plates selling in Ohio territory are making concessions on shapes, and material has been sold at Columbus, O., on a basis of 1.47c Pottsville for structural material. Some of the eastern makers of plates are firmer in their views than they were recently and are firmly maintaining 1.60c Pittsburg. The demand for shafting continues good. Bar iron is irregular, and Cleveland prices are a shade lower than they have been recently. Bridge builders in this territory are inquiring on material for three bridges which three railroads in northern Ohio will shortly contract for. One bridge calls for 2,200 tons of plates and angles, another 600 tons and the third 1,300 tons. A local mill took the 1,000 tons of bar iron for which the Merchants' Despatch Transportation Co., East Rochester, N. Y., was recently inquiring, the price being a shade lower than 1.55c. Specifications for 500 tons of ship plates were received by a Western New York concern.

Cast Iron Pipe.—Two bidders appeared in the letting of about 3,400 tons of pipe by the city of Cleveland a few days ago. On 3,400 tons of cast iron pipe, 3 to 36 inches inclusive, the United States Cast Iron Pipe & Foundry Co. bid $85,000; the American Car & Foundry Co. bid $93,810. On 140 tons of special castings, 3 to 36 inches inclusive, the United States company bid $7,910, while the American company bid $8,227.50. The United States company was the only bidder on 60 tons of miscellaneous castings, $3,240. All bids were f. o. b. Cleveland.

Old Material.—The continued slackness in demand for the various forms of scrap is reflected in a gradual decline in prices which has been made necessary in order that the material might be moved in any quantity. As yet no distinct buying movement has developed, although dealers continue to assert, as they have been doing for some time past, that it cannot be long before consumers are compelled to enter the market to replenish exhausted stocks and make new contracts. Reductions of 50 cents a ton are noted in old iron rails, old car wheels, agricultural malleable, country mixed steel, railroad wrought, machine shop turnings, wrought drillings and cast borings. We quote, gross tons, f. o. b. Cleveland, as follows:

Old iron rails	$17.50 to 18.00
Old steel rails (under 6 feet)	17.00 to 17.50
Old car wheels	16.50 to 17.00
Old steel boiler plate	13.50 to 14.00
Malleable iron (railroad)	16.00 to 16.50
Steel axles	20.00 to 20.50
Malleable iron (agricultural)	14.00 to 14.50
Heavy steel	15.00 to 15.50
Country mixed steel	13.00 to 13.50

We quote, net tons, as follows:

No. 1 R. R. wrought	$15.50 to 16.00
No. 1 busheling	13.00 to 13.50
No. 1 machine cast	14.75 to 15.00
Axle turnings	11.00 to 11.50
Machine shop turnings	9.00 to 9.50
Grate bars	12.00 to 12.50
Pipes and flues	11.50 to 12.00
Tank iron	11.00 to 11.50
Sheet iron	6.50 to 7.00
Wrought drilling	9.00 to 9.50
Stove plate	13.00 to 13.50
Cast borings	7.50 to 8.00

CINCINNATI.

Better Feeling Prevails and More Inquiry is Coming Out.

Office of THE IRON TRADE REVIEW,
N. E. cor. Fourth and Elm Sts., Mar. 1.

Pig Iron.—While there have been no developments along the line of new business, there is at the same time an undercurrent of cheerfulness and a better feeling prevails. Southern furnaces apparently are not actively engaged in seeking business for the last half at present prices, yet, in the event of any tonnage showing up previous to that time, are said to be willing to make quotations to meet the requirements of each case as it is presented. As a result, exact quotations are rather difficult to determine. Then again, the resale iron that has come out during the past week or two has a depressing effect on the market, but the amount of this iron now remaining unsold is said to be small, and will exert little influence on future conditions. The northern situation does not appear to have changed, and is fairly strong. Quotations of $17, Ironton furnace, are being well main-

tained over the last half of the year, yet it is said that for business offering previous to July 1, some concessions can be obtained. There is one inquiry from a local pump concern for 1,800 tons of southern No. 2, and 350 tons of high silicon, delivery running throughout the remainder of the year. Another inquiry comes from a southern Indiana melter, and is for 75 tons of high silicon. Another Indiana melter bought 200 tons of northern foundry and 200 tons of malleable, delivery covering the last half. We quote for any delivery during the year, based on freight rates of $3.25 from Birmingham, and $1.20 from Ironton, as follows:

Southern fuondry No. 1	$17.25 to 17.75
Southern foundry No. 2	16.75 to 17.25
Southern foundry No. 3	16.25 to 16.75
Southern foundry No. 4	16.25 to 16.75
Southern No. 1 soft	17.25 to 17.75
Southern No. 2 soft	16.75 to 17.25
Southern gray forge	16.00 to 16.50
Northern No. 1 foundry	18.70
Northern No. 2 fourdry	18.20
Northern No. 3 foundry	17.70
Jackson county 6 per cent silicon	20.20
Jackson county 8 per cent silicon	21.20
Jackson county 10 per cent silicon	22.20

Coke.—There appears to be a little more life to the market, and several new contracts for foundry grades have been closed during the week. A spirit of unrest, however, is manifest, and considerable speculation is being indulged in as to the ultimate outcome of the labor troubles which are now agitating parts of the country. Prices are easy, and apparently unchanged, and in the leading coke producing districts are as follows:

Connellsville District:	Prompt shipment.	First half 1910.
Foundry coke	$2.75 to 3.00	$2.75 to 3.00
Furnace coke	2.00 to 2.25	2.30 to 2.40
Wise county district:		
Foundry coke	2.75 to 3.00	3.00 to 3.25
Furnace coke	2.10 to 2.25	*Sliding [scale basis.
Pocahontas district:		
Foundry coke	2.75 to 2.90	2.85 to 3.10
Furnace, coke	2.50 to 2.75	2.75
New River:		
Foundry coke	2.75 to 3.00	2.90 to 3.25
Furnace coke	2.25 to 2.50	2.35 to 2.50

*Sliding scale basis means $1.60 for coke based on $9, Birmingham, for pig iron, with an advance of 16⅔ per cent of the amount over $9 at which pig iron is quoted. This is the usual basis. Other forms of sliding contracts are also made.

Finished Material.—There is nothing pending in the way of new structural specifications, that is of any consequence, and demand is quiet. There are rumors that some shading is being done along certain lines, but this has not been verified. Shipments are coming forward in a satisfactory way, but deliveries on old contracts are not gaining, and are from two to three months behind. Steel bars and small shapes sold on steel bar card are quotable at 1.50c base, Pittsburg, and plates and structural 1.60c net, Pittsburg.

Old Material.—There is so little doing and demand is so light that it is a difficult matter to obtain anything like correct quotations. Prices are weak and irregular. Dealers are compelled to take the initiative if they dispose of their metals. We quote, dealers' prices, as follows:

No. 1 railroad wrought, net tons.	$13.00 to 13.50
No. 1 machinery, net tons	13.00 to 13.50
No. 1 busheling, net tons	11.50 to 12.00
Old iron rails, gross tons	18.00 to 18.50
Old steel rails (rerolling), gross tons	17.00 to 17.50
Old short lengths, gross tons	15.00 to 16.00
Old iron axles, net tons	19.00 to 19.50
Heavy melting scrap, gross tons	13.50 to 14.00
Stove plate, net tons	10.00 to 10.50
Heavy turnings, net	9.00 to 9.50
Cast borings, net tons	7.00 to 7.50
Car wheels	15.50 to 16.00
Grate bars	11.00 to 11.50

PHILADELPHIA.

Large Tonnage Southern Iron Sold.—Shape Prices Still Easy.

Feb. 28.

Pig Iron.—Heavier buying for forward shipment by the cast iron pipe companies than has been done by these interests for some time, has featured the pig iron market of the district the last week. An aggregate of approximately 25,000 tons has been taken by these consumers and of this tonnage about 21,000 tons were Southern iron for delivery over the next six months on a basis of about $13.50 Birmingham for No. 2. The bulk of this iron will go to one pipe maker and the purchase represents the regular requirements of Southern iron for this plant over the forward period. Another of the cast iron pipe companies is now in the market for 5,000 tons for third quarter, divided equally into No. 3 and gray forge grades. Resale Southern iron was offered in this territory this week at $13 Birmingham for No. 2, one lot of 2,000 tons of this grade for immediate shipment which could not be taken in by the original purchaser, having been involved. As far as known the iron has not been taken. Beyond the pipe companies' purchases, the amount of iron going under contract is not large. The basic market is practically stagnant. Buyers are unwilling to pay asking prices and sellers are not anxious to force the situation. Some Virginia iron is moving to this territory, several thousand tons having been taken in small lots. The range of the market is $15.25 to $15.50 furnace for No. 2X and $18.25 to $18.50 delivered for first half, although it is reported as low at $15 furnace has been done in exceptional cases. One sale of 250 tons of No. 2X and 250 tons of No. 2 plain for the next few months delivery is noted. Eastern Pennsylvania makers are selling at $18.25 delivered and upward and same iron, not regarded as of strictly standard analysis, may be bought at lower figures. The International Steam Pump Co. has put out an additional inquiry for about 5,000 tons divided between its Cambridge and Cincinnati plants for delivery in one case over the balance of the year, and in the other through third quarter. A reluctance of some sellers to take on much additional tonnage of standard low phosphorus because of uncertainty over ore deliveries, has resulted in as high as $24, delivered this district, having been paid. This price was done on a lot of 1,000 tons for March, April, May delivery. Makers of standard low phosphorus are very strong in their ideas of prices. There is some interest in malleable, for which grade $17 furnace is being asked by Mahoning and Shenango valley makers. Forge selling is light. We quote for Philadelphia delivery, first half as follows:

No. 1X foundry	$18 75 to 19.25
No. 2X foundry	18.25 to 18.75
No. 2 plain	17.75 to 18.25
Standard gray forge	17.00 to 17.25
Basic	18.50 to 18.75
Low phosphorus	23.00 to 23.50
No. 2 Birmingham	18.00 to 18.50
No. 2X Virginia	18.25 to 18.50
No. 2 plain, Virginia	17.75 to 18.25

Finished Materials.—Labor troubles in Philadelphia and South Bethlehem are accountable for some unfavorable sentiment in this territory and the situation in finished material is not showing any marked improvement. Specifications are rather irregular, having increased with some mills the past week and fallen off with others. The easiness in shape prices is still to be noted and 1.50c Pittsburg or 1.65c Philadelphia has been done. Quotations of 1.55c Pittsburg this week have failed to secure orders. The shading in shapes is attributed to the decrease of tonnage on mill books, as deliveries on ordinary assortments can be had in from two to three weeks from some makers. The Pennsylvania railroad has ordered seven steel car floats, four from the Wm. Cramp Sons' Engine & Shipbuilding Co. and three from the New York Shipbuilding Co. and these will require a total of about 2,000 tons of plates and shapes. A number of additional floats, tugs and other vessels are being figured upon and these will take considerable tonnage. The Fairmont hotel, this city, has not yet been awarded, the steel tonnage in this structure according to latest estimates is 2,500. Bids went in Feb. 28 for about 400 tons for a coal packet for the James Bradley Co., this city. Bids have been asked for a roundhouse for the Penn-

sylvania railroad at Orangeville, Baltimore. The plans are being figured for the steel hot metal bridge to connect the plants of the Alan Wood Iron & Steel Co. and the Richard Heckscher Sons' Co. which has requirements of upwards of 1,000 tons. Plate prices continue stronger than shapes due in a large measure to the filled up condition of the leading makers. Eastern mills report their quotations at from 1.60c to 1.65c Pittsburg but 1.55c Pittsburg or 1.70c Philadelphia is being done by the same mills. Deliveries in the east on both universal and sheared plates are very prompt, running from two to three weeks. About 2,000 tons for cars which the Lehigh Valley railroad will build, are still pending. Makers of steel bars are now making shipments upon orders taken in October, November and December. Bar iron demand continues unsteady and some mills are reported to be rolling steel bars from billets, upon which they are getting about $2 a ton premium for prompt shipment. Car business is not coming out as fast as expected. The Berwick plant of the American Car & Foundry Co. is now completing about 60 steel cars daily. We quote the following prices for Philadelphia deliveries upon finished material: Structural shapes, 1.65c to 1.75c; plates 1.70c to 1.75c; steel bars, 1.60c to 1.65c; refined bar iron 1.60c to 1.65c; open-hearth 4 x 4 billets $30, eastern mill.

Old Material.—Some relief in embargo conditions has been brought about but owing to the labor situation at South Bethlehem and the filled up yards of consumers, the new tonnage of old material moving is still small. The scrap embargo against the plant of Worth Bros. has been raised, but a new ban has been placed on mill cinder consigned to this user. The Bethlehem Steel Co. has been buying some grades, principally cast borings but is taking little steel, and its operations are now being affected by labor troubles. Cast scrap is dull but some of the iron rolling mills are inquiring a little freer, although their operations are irregular. There has been some outside buying by at least one of the associated mills but it is positively stated that the arrangement is still intact. At present the combined mills are buying little material. Prices are somewhat nominal with a downward tendency. We quote gross tons, Philadelphia delivery, as follows:

Old steel rails (rerolling)	$17.75 to 18.25
Heavy melting steel	16.50 to 17.00
Old car wheels	16.50 to 17.00
Old iron car axles	26.00 to 27.00
Old steel car axles	22.50 to 23.00
No. 1 railroad wrought	18.50 to 19.00
Wrought pipe	16.00 to 16.50
Cast borings	11.00 to 11.50
Wrought turnings	13.00 to 13.50
Heavy cast scrap	16.00 to 16.50
Railroad malleable	16.50 to 17.00
Stove plate	12.50 to 13.00

ST. LOUIS.

Sales of Basic, Foundry and Charcoal Iron Encourage Pig Makers.

Feb. 28.

Pig Iron.—Sales of pig iron in the St. Louis territory last week give evidence of an upward tendency in the market, and local agents are of the opinion that the best is yet to come. A sale of 5,000 tons of basic for shipment over the remainder of the year, delivery to begin at once, was made to one concern Saturday, and the same company is expected to place an order for an additional 5,000 tons before the present week closes. Another sale of 400 tons of car wheel iron was made, and the purchaser has an inquiry pending for 5,000 tons. An implement company in Iowa placed an order with a St. Louis sales agent for 1,000 tons analysis iron, for last half delivery. Inquiries are out for about 3,500 tons of Southern No. 2 for balance of the year delivery. Prices range from $13 to $13.50, Birmingham, for No. 2, for all deliveries. Ohio iron is offered at $16.50 to $17, Ironton. Foundrymen are said to be stirring, believing that the bottom has been reached in prices, and local sales agents are looking for a good business movement to begin. One of the large sales that is expected to materialize soon will be for something like 5,000 to 10,000 tons of southern iron for a St. Louis steel company. An inquiry from this concern has been pending for several weeks, and the understanding has been all along that the order would be placed if the right price were made. Our quotations on southern iron delivered, to which the Birmingham freight of $3.75 has been added, follow:

No. 1 foundry	$17.25 to 17.75
No. 2 foundry	16.75 to 17.25
No. 3 foundry	16.25 to 16.75
No. 4 foundry	15.75 to 16.25

Coke.—The market remains dull, with prices around $2.85 to $3.25 for 72-hour Connellsville foundry. Connellsville 48-hour furnace coke is offered at $2.65 to $2.75 for prompt shipment, and $3 for delivery on contracts. There are no large inquiries out, Virginia 72-hour foundry is offered at $2.75 to $3; Virginia 48-hour furnace, $2.50 to $2.75 for prompt delivery. These prices are f. o. b., ovens in each instance. The freight to East St. Louis and St. Louis is $2.80, and $2.70 from the Virginia fields, when shipment is destined beyond St. Louis.

Old Material.—Not a single transaction in scrap, worth mentioning, is reported for last week, and there is no business of consequence in sight. These quotations are made for St. Louis, although it is freely admitted they could be shaded should a real buyer appear:

Old car wheels	$17.00 to 17.50
Old iron rails	19.00 to 20.00
Rerolling rails (4 ft. nad over)	16.75 to 17.25
Old stel rails e(2 ft. and under)	16.50 to 1.00
Light section relayers, 45 lbs. and under, subject to inspection	21.00 to 23.00
Relaying rails, subject to inspection	24.50 to 25.00
Frogs, switches and guards	15.50 to 16.00
Heavy melting steel	15.50 to 16.00
Shoveling steel	14.00 to 14.50

We quote, net tons, as follows:

No. 1 R. R. wrough....t	$14.50 to 15.00
No. 2 R. R. wrought	13.50 to 14.00
Arch bars and transoms	17.50 to 18.00
Knuckles, couplers and springs	15.00 to 15.50
Shafting	17.00 to 17.50
Iron car axles	20.00 to 21.00
Steel car axles	20.00 to 21.00
Locomotive tires	18.00 to 18.50
No. 1 country wrought	12.25 to 12.75
Pipes and flues	11.75 to 12.00
No. 1 cast 150 lbs. and less	14.00 to 14.50
No. 1 busheling	13.00 to 13.50
No. 2 busheling	9.75 to 10.25
No. 1 boiler cut	11.50 to 12.00
Boiler punchings	13.00 to 14.00
Cast and mixed borings	7.50 to 8.00
Machine shop turnings	10.00 to 10.50
Railroad malleable	13.25 to 13.75
Agricultural malleable	11.50 to 12.00
Stove plate and light cast scrap	11.50 to 12.50
Angle bars, splices, etc. (iron)	17.25 to 17.75
Angle bars, steel	15.50 to 16.00

BUFFALO.

Heavy Inquiry for Pig Iron, But No Important Sales.

Office of THE IRON TRADE REVIEW,
932 Ellicott Square, Mar. 1.

Pig Iron.—There are inquiries in this market aggregating about 50,000 tons of foundry and malleable, but there have been no important closings during the past week, although considerable activity is reported among the pig iron consumers throughout western and central New York. The tone of the market, however, is quiet, and quotations generally are unchanged. It is learned that interests holding at higher figures are selling at slightly lower prices for prompt and forward deliveries, but this difference affects chiefly the price on forward delivery tonnage, No. 2X foundry being sold in some cases at $17.25, which is 75 cents less than the same interests quoted three months ago. The minimum prevailing price on No. 2X foundry for some time has been $17, and this fairly represents the selling price at this time, although a few special orders have been taken at 25 cents under this price. Tonnage under contract is moving out freely and the interests having contracted for iron to be delivered in April are urging delivery in March wherever possible. The interest in tonnage for last half is increasing and it is evident from inquiries now on the market that many buyers are seriously considering the present time as a good

period during which to cover their needs for the remainder of the year. We quote, f. o. b. furnace at Buffalo, as follows:

No. 1X foundry	$17.50 to 18.00
No. 2X foundry	17.00 to 17.50
No. 2 plain	17.00 to 17.25
No. 3 foundry	16.75 to 17.00
Gray forge	16.75 to 17.00
Malleable	17.50 to 17.75
Basic	18.00 to 18.50
Charcoal	20.00 to 21.00

Finished Products.—The most important contract placed here recently was that given to the Lackawanna Steel Co. by the Merchants' Despatch Transportation Co., for its requirements at Rochester, amounting to 15,000 tons of shapes and plates, deliveries to be made during the second and third quarters. This material is to be used by the Merchants' Despatch Transportation Co. in the construction of steel underframes for cars. The Merchants' Despatch Transportation Co. has also placed an order for 1,000 tons of bar iron at Cleveland, to be used in underframe construction, bar iron being purchased instead of steel, owing to the delay attending the deliveries from the mills. The buyer has orders for 1,000 cars and these will be built at the new Rochester plant of the company, which is nearly completed. Deliveries on the shapes and plates and bar iron will be made to the Rochester plant. Specifications on new business of importance are very slow in coming out and while the steel interests here feel that the outlook is favorable, business at the present time is very quiet.

Old Material.—The scrap market rules very quiet and little tonnage has been placed the past week. Apparently the outlook is a little brighter, but only nominal prices may be made at this time, and we quote, gross tons, f. o. b. Buffalo, as follows:

Heavy melting steel	$16.50 to 17.00
No. 1 railroad wrought scrap	18.00 to 18.50
No. 1 railroad and machine cast scrap	16.50 to 17.00
Old steel axles	21.00 to 21.50
Iron axles	26.00 to 26.50
Car wheels	18.00 to 18.50
Railroad malleable scrap	16.50 to 17.00
Machine shop turnings	11.25 to 11.75
Cast iron borings	9.25 to 9.75
Low phosphorus steel scrap	20.00 to 21.00
Old iron rails	19.00 to 20.00
Tank iron	13.50 to 14.00
Sheet iron	9.00 to 9.50
Stove plate	13.50 to 14.00
Pipe and flues	13.50 to 14.00
Grate bars	12.00 to 12.50
Boiler plate	14.00 to 14.50

BRITISH IRON MARKET.

Pig Iron Trade Steady and Prospects Are Brighter.

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, England, Feb. 19.

The pig iron market has continued remarkably steady during the week, and No. 3 today is sold at 51s 3d ($12.54) with 51s 11½d ($12.71) three months. The striking feature of the market is that with a comparatively small business doing, the tone should be so firm and hopeful. Makers are well off for orders, and prospects are encouraging. Some surprise is expressed that the tone is so little affected by the less encouraging character of the reports from the United States. Everybody believes that a busy time is immediately ahead. The first two months are always periods of minimum business, and the firmness is therefore a happy augury for the spring season. Trade is improving with Italy and among other inquiries in the market from there is a foundry order for 10,000 tons. There are signs also that more iron will be wanted for Germany. East coast hematite makers are well provided with contracts, but raw materials are dearer, while selling prices of iron do not rise. Coke has once more taken an upward turn at 18s 9d per ton. Generally speaking, shipments are disappointing, exports this month so far being 37,947 tons, compared with 59,526 for an equal number of days last month. The amount in store is now 407,565 tons, the increase this month being about 7,000 tons.

Finished Material.—In the finished material trade, the position is steadily improving, and in an unostentatious way a good deal of trade is being placed. The finished steel market is very strong, and producers of semi-finished steel still hold a dominant position. In the Manchester district, it is said billets can be bought for £5 2s 6d, but this would seem to be unusual, the general price being £5 5s. For long forward contracts sellers are asking £5 10s to £5 12s 6d, partly with the idea of discouraging business. Advances have now been registered in Lancashire, Scotland and North Staffordshire for bars. Galvanized sheets are having an extraordinary run, every mill producing its maximum output, with order books well filled. The quoted price is now £12 to £12 5s, although here and there it is possible to obtain deliveries for £11 15s, apparently because some makers bought their raw material favorably in the early days of the recovery. It is reported that an informal consultation has taken place between leading houses, with a view to the restoration of the association which came to grief about eight months ago, and it is not at all unlikely that another agreement may be carried through.

It cannot be said that the bar market is quite as strong as other departments. Makers have been obliged to advance prices, owing to dearer raw material, but they are finding it hard to get the higher figures.

GERMAN IRON MARKET.

Price Tendency is Firm and Demand is Strong.

Düsseldorf-Obercassel, Feb. 10.

The tendency of our iron and steel market is very firm in every respect. The last weeks have brought plenty of work and important improvements of the prices. The demand remains strong for all articles, although the last reports from America are very discouraging.

In pig iron, especially hematite, the business is rather dull, because the producers are rather sold out for 1910. The price for best Westfalian hematite today is not less than 66 marks per 1,000 kilograms f. o. t. maker's works ($15.75). This means an improvement of about $4 per 1,000 kilograms in comparison with the lowest prices in 1909. Belgium has made two contracts of Thomas pig iron, one of 20,000 tons, and another of 60,000 tons Thomas pig iron for quick delivery with Westfalian makers, and further important quantities are still in demand.

Foreign ores are very firm; best Bilbao Rubio cannot be obtained at less than 22 marks c. i. f. Rotterdam for 50 per cent Fe. ($5.25). Blast furnace coke remains firm at 16.50 marks ($4) per 1,000 kilograms f. o. t. mines. The coal business is most active, especially for export to France and for the big Atlantic lines. The situation on the English coal market is very unreliable on account of labor troubles. Germany is getting the bulk of the foreign orders.

The firm Krupp of Essen has succeeded in obtaining a large order for axles for wagons and locomotives for the English Great Western Railway, Krupps having cut the cheapest English quotation by about 40 per cent. The pig iron production is increasing and also the steel production. The prices for rails, girders, billets, etc., have been increased by 10 marks ($2.50) per 1,000 kilograms and bar iron and sheets are fully 20 marks ($5) per 1,000 kilograms higher than 8 weeks ago.

The constant and strong improvement in the prices for raw materials, especially for iron ores, will undoubt-

edly cause a further and considerable rise in the prices for finished products; this, together with a strong demand and cheap money, makes the future appear very favorable.

METAL MARKETS.

ST. LOUIS.

Feb. 28.

Lead and Zinc.—The price of zinc blende, 60 per cent grade, rose to $42.50 a ton in the Missouri-Kansas-Oklahoma district Saturday, compared with $40 of the previous week. Extra choice lots brought $43 a ton. The average price per ton was $39.68, as compared with $37.89 for the preceding week. Calamine brought a top price of $28 for 40 per cent grades, ranging down to $23 and $21, as compared with $23.88 the week before. Lead sold for $53 a ton, on a basis of 80 per cent, with an average price of $52.57 a ton, compared with $53.08 the previous week. St. Louis spelter closed at $5.45, as against $5.35 the week before. Pig lead was sold at $4.50, as compared with $4.40 the week before.

Because of the strength shown in the market last week, it is believed by operators that the bottom has been reached in prices, and that better values will be secured from now on. It was estimated that the amount of zinc ore sold last week was slightly in excess of the production, leaving a surplus in bins of about 9,000 tons.

CHICAGO.

Feb. 28.

New Metals.—There is an absence of buying support to this market, and prices are not being maintained, even by the leading interests in the different metals, and the independent dealers have been cutting prices for some time.

We quote as follows: Lake copper, carload lots, 14 to 14⅛c; casting, 13⅝c; smaller lots, ¼c to ⅜c higher. Spelter, 5.55c to 5.60c; lead, desilverized, 4.60c to 4.65c in 50-ton lots, corroding, 25c per 100 pounds higher; sheet zinc, $7.50 list f. o. b. La Salle in car lots of 600-pound casks; pig tin, 33½c to 33¾c; Cookson's antimony, 10½c; other grades, 9¾c to 10¼c.

Old Metals.—Trading in the old metals is almost entirely at a standstill, and values are weaker, in sympathy with the new material, as well as from poor business. Prices are fractionally lower, and even at those levels are only nominal.

We quote, dealers' selling prices, as follows: Copper wire, 13½c; heavy copper, 13½c; light copper, 11½c; heavy red brass, 13c; heavy yellow brass, 10¼c; light brass, 7½c; No. 1 red brass borings, 10½c; No. 1 yellow brass borings, 8c; brass clippings, 9½c; tea lead, 3.80c; lead scrap, 4½c; zinc, 4¼c; tin pipe, 31c; tin foil, 29c; pewter, 25c; electrotype plates, free from wood, 4½c; electrotype dross, 3¼c; stereotype plates, 5c; stereotype dross, 3½c; prime slab zinc dross, $80 per ton.

NEW YORK.

March 1.

Copper.—Considerable buying of copper is noted, and while some report a very optimistic view of the buying movement, still it would not be out of the way to say that nearly 25,000,000 pounds were disposed of in the last week. Consumers are bare of stocks and trade has picked up wonderfully, in the finished lines, during the past fortnight. The business done was on a basis of 13.37½c net cash for electrolytic. Sales, however, were made 5 points lower, but the absolute bottom was 13.30c. We report the sale of a round lot of high grade lake to a domestic consumer at 13.75c.

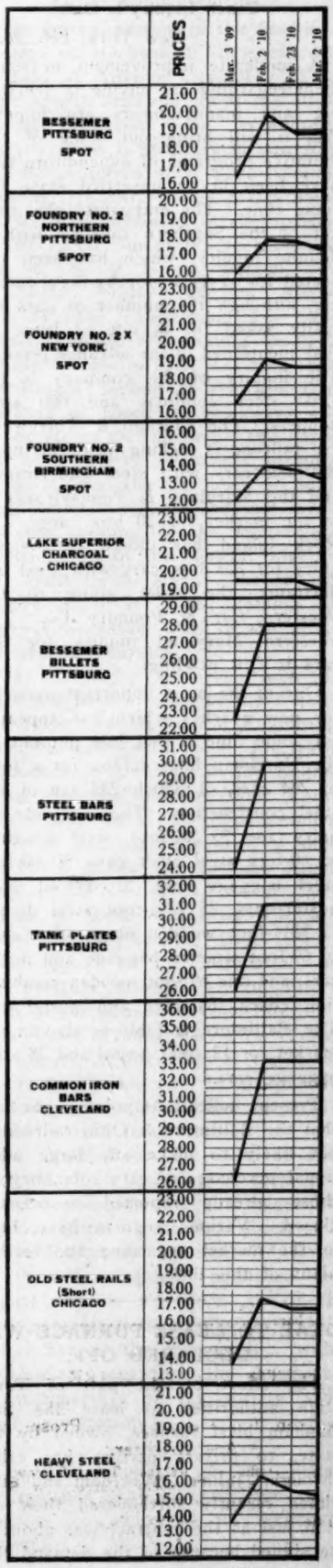
Pig Tin.—The market is very quiet and fully a half cent lower. The demand has simmered down to almost nothing. As is usual the tin market is going by contraries. In America the deliveries were larger than anticipated, being 3,600 tons, but on account of the large arrivals here, nearly 3,800 tons, stocks increased and were 3,569 tons. Tin was sold early this week at 32.75c and now can be had at even lower figures.

Lead.—Although not very active the lead market displayed marked strength during the week. From the wide margin between bid and offer price of last week, 4.45c-4.60c, in New York, the quotation has advanced to 4.60c-4.70c in New York, with very little metal to be had at the inside price.

Spelter.—An active demand has set in for spelter. The market today is 5.70c-5.80c, New York, and 5.60c-5.70c, St. Louis, with the trade almost unanimous in the belief that conditions will tend towards improvement from now on. The United States Steel Corporation has been a large buyer during the week, after having been out of the market since last year.

Antimony.—Prices of this metal are without change at 8.50c for Cookson's and 8.25c for Hallett's.

PRICE CHART.



SOME IMPROVEMENT

Noted in Car Buying Situation—Large Coach Inquiry is Out.

New York, Feb. 28.

A moderate improvement in sentiment regarding car buying is developing and manufacturers are hopeful that it will bring out some of the tentative programs of expenditure that have been in an unsettled state for some time. The entry into the market of the Southern railroad with a definite inquiry, which has been expected for several months, is encouraging, although the number of cars actually asked for is not as large as that mentioned in the advance reports. The inquiry of the company is for 3,000 steel gondolas and 600 steel hoppers. The Chicago & Northwestern railroad is seeking proposals upon 200 box cars with steel underframes and the Maryland & Pennsylvania is in the market for 20 box cars. The Rock Island has closed on its inquiry for 825 box cars with steel underframe, the order going to the Western Car & Foundry Co. The Western Maryland inquiry for 900 cars is still pending.

One of the most important inquiries for new coaches which has appeared for some time is that just put out by the Harriman lines calling for a total of 264 cars, of which 235 are of all-steel construction. The complete inquiry for 75 60-foot steel coaches, 50 60-foot steel chair cars, 50 60-foot steel baggage cars, 35 60-foot steel postal cars, 25 72½-foot steel diners, 12 72½-foot wooden observation cars, 16 69-foot wooden baggage and postal cars, and one 69-foot wooden combination coach, baggage and postal car. The Baltimore & Ohio is also in the market for 12 steel postal and 28 steel baggage cars.

Present indications point to the fact that the Baltimore & Ohio railroad is not likely to make any large additional purchases of cars soon, beyond those already reported as actually closed. Various reports have been in the market regarding the further plans of this line.

DEAL TO LEASE FURNACE WAS DECLARED OFF.

The effort on the part of Texas state authorities to lease the Sam Lanham blast furnace, owned by the state, to private parties, has fallen through. John L. Wortham and associates recently surrendered their option just as the contract was about to be signed because of the demand that they execute an anti-trust affidavit. Mr. Wortham had offered to pay an annual rental of $10,000 for the use of the stack, the foundry and equipment of the iron plant at the Rusk penitentiary, as well as to buy iron ore from the state at 90 cents a ton. So far, no other bidders have appeared.

SALE OF MAST PLANT IS BEING CONTESTED.

The sale of the plant of P. P. Mast & Co., Springfield, O., to the American Seeding Machine Co., for $170,000, is being contested by Howard D. Maize, who, until three weeks ago, was co-receiver of the Mast company. The other receiver, Mr. Foos, reported several days ago to the federal court at Cincinnati that he had transferred the property and had received the purchase price. Mr. Maize, who was president of the company, charges that the price received was not the best obtainable, declaring that he knows of others who are willing to bid at least $180,000 for the property, and he further alleges that unless the sale is set aside it will work irreparable injury to him.

HAD PROSPEROUS YEAR.

A prosperous year is shown by the financial reports submitted at the annual meeting of the American Hardware Corporation. The various plants of the company enjoyed steady operations throughout the year. The newly-elected board of directors organized with the choice of the following officers: President, Philip Corbin; vice presidents, Charles M. Jarvis and Charles H. Parsons; secretary, Charles E. Wetmore; assistant secretary, Charles B. Parsons; treasurer, Andrew J. Sloper; assistant treasurer, Isaac D. Russell.

BUILDING STEEL PLANT.

The Upson Nut Co., Cleveland, as soon as the weather opens, will begin the construction of foundations for the open-hearth furnaces of its proposed steel plant. During the winter considerable construction work was carried on and the plant is beginning to assume definite shape.

The Dundee Brass Mfg. Co., Dundee, N. Y., is planning, through its board of directors, to reorganize the plant and put in more working capital. The factory is running and filling orders under the management of E. C. Bulche. No further definite steps have been taken up to the present time in the reorganization.

RAILROAD AWARDS

For Structural Work are Larger—Numerous Commercial Lettings.

New York, Feb. 28.

The same degree of slightly quickened interest by buyers that is becoming discernible in finished iron and steel conditions is making its appearance in the structural situation. The railroads are distributing a larger patronage the past several weeks than had been expected by leading fabricating interests, and this tonnage, though not large, is regarded as a favorable indication of the trend of events. Within the past week, probably 6,000 tons have been placed by the railroads, including the largest and already reported contract of 3,500 tons for Worcester, Mass., work by the New York, New Haven & Hartford railroad. The American Bridge Co. has taken about 1,800 tons of this business, divided into 700 tons for signal bridges for the Pennsylvania lines west and for miscellaneous bridge work, as follows: Pennsylvania railroad, 300 tons; Oregon & Washington, 200 tons; Duluth, Mesabi & Northern, 200 tons, and Northern Pacific, 400 tons. The Norfolk & Western has also placed 900 tons of bridge work with the Virginia Bridge & Iron Co. A new inquiry now awaiting proposal calls for 1,200 tons for track elevation work of the Pennsylvania lines west of Chicago. The largest commercial project now in sight is the Otis bank building, at Chicago, for which bids have just been taken. This structure will require 6,000 tons. The Rector hotel, New York, awarded some time ago, is now ready for the steel contract, which will involve 2,000 tons. The Thompson-Starrett Co. is the contractor. This same firm has the contract for the Yeon building, Portland, Ore., just placed, with steel requirements of about 1,500 tons. The Central hotel, Denver, 800 tons, is now up. Among the late steel contracts awarded are 1,300 tons to be fabricated by the American Bridge Co. and erected by Post & McCord, for the Brooklyn bakery of the Ward-Corby Bakery Co.; 1,100 tons to the Wm. E. Lyon Iron Works, for the Bronx bakery of the same company; 450 tons to the Riter-Conley Mfg. Co., for the new Hudson & Manhattan repair shops at Jersey City; 500 tons to the Llewellyn Iron Works for the Hellman building, Los Angeles; 700 tons to Levering & Garrigues for the American Press Association building, West Thirty-ninth street, this city, and 350 tons for extensions at Morava by the International Harvester Co. The Germania Life Insurance buildings, 1,000 tons, at Fourth avenue and Seventeenth street, this city, will go to the American Bridge Co.

TWO FLEETS

Have Been Amalgamated—Whalebacks Will Carry Ore.

Dispatches from Hamilton, Ont., announce the amalgamation of the fleets of the Inland Navigation Co. and the Midland Navigation Co., the Playfair interests having bought out R. O. and A. B. Mackay, of the Inland Navigation Co. Both fleets will now be operated under the management of James Playfair, of Midland.

Stockholders of the Etna Steamship Co. and the Cleveland Steamship Co. have voted to consolidate under the management of Capt. John Mitchell. The stockholders of the Etna Steamship Co. received share for share and the Cleveland Steamship Co., 1¼ shares. It is planned to retire the bonds and to operate the steamers without insurance. The insurance premium on this fleet amounts to $150,000.

The Tonawanda Iron & Steel Co., North Tonawanda, N. Y., will handle about 400,000 tons of ore during the coming season and has chartered tonnage on the basis of 85 cents to move it, being an advance of 10 cents over last year's rate. The whaleback barges which the Pittsburg Steamship Co. turned over to the Great Lakes Engineering Works when it gave contract to that company for the construction of three 600-footers, will be towed by the Tonawanda Iron & Steel Co.'s steamers this year. Each barge has a capacity of about 3,100 tons.

Contracts to cover about 1,000,000 tons of coal have been made at 30 cents to the head of the lakes. Everything points to a late opening of navigation this year. It is not expected that any ore will be moved before May 1.

NEW TIN PLATE PLANT IN OPERATION.

The new plant of the Phillips Sheet & Tin Plate Co., located at Weirton, Hancock county, W. Va., is now in operation. The plant contains ten hot mills and ten stands of cold rolls, the hot mills being operated by a 32 x 54 x 60 twin tandem compound engine direct connected, five mills on each side.

Furnished Equipment.—in an article published in THE IRON TRADE REVIEW of Feb. 24, in regard to the Lackawanna Bridge Co. plant at Buffalo, the fact was inadvertently omitted that the punch and shear and planer equipment was furnished by the Cleveland Punch & Shear Works Co., Cleveland. This equipment consists of angle shears, plate shears, horizontal punches and rotary planers.

SHIP BUILDING PLANT FOR WINNIPEG.

The Doty Engine Works Co., Ltd., of Toronto and Goderich, Ont., has organized a branch at Winnipeg, Manitoba, and has applied for a Manitoba charter. The site for a shipbuilding yard has been obtained at the foot of Water street, and offices have been established in the Bank of Hamilton building. In connection with the shipyard, the company will operate a machine shop and boiler shop for the construction of the machinery required for building the steam craft. Several contracts have been received for building steel steamers of the twin-screw type. It is expected that the plant will be operating before next fall.

HOW THE PLANT WAS OPERATED.

During the recent excessively cold weather in Pittsburg, when many of the mills in the district had their natural gas shut off, the Carbon Steel Co. continued to run its open-hearth furnaces, having previously equipped them with an oil burning system consisting of tanks, pumping appliances and water-cooled burners remaining permanently in the ports and ready to burn oil on ten minutes' notice. This apparatus is designed and manufactured by Tate, Jones & Co., Inc., Pittsburg.

PLANNING STEEL FOUNDRY.

The Southern Pacific Railroad Co. is planning the erection of a steel foundry at Sacramento, Cal. It is proposed in its foundry to work over the thousands of tons of steel scrap which have accumulated at the Southern Pacific shops in Sacramento. The statement is made that the Sacramento shops will be moved and greatly enlarged.

NEW YORK COPPER EXPORTS.

Exports of copper for February amounted to 24,794 tons, compared with 13,886 tons in February last year. This was an increase of 10,908 tons.

The Bellefonte Foundry & Machine Co., Bellefonte, Pa., has received an order from the Pierce-Arrow Motor Car Co., of Buffalo, for two power hammers.

SPRING MEETING

Of the A. S. M. E. at Atlantic City—Other Announcements.

The spring meeting of the American Society of Mechanical Engineers will be held at Atlantic City, May 31 to June 3, with headquarters at the Marlborough-Blenheim. On Wednesday evening, June 1, honorary membership will be conferred upon Rear Admiral Geo. W. Melville, United States navy, retired, past president of the society.

The next monthly meeting of the A. S. M. E. in Boston will be held Friday evening, March 11, in the auditorium of the Edison Electric Illuminating Co. The Boston Society of Civil Engineers and the Boston Section of the American Institute of Electrical Engineers will co-operate in the meeting. The paper will be by M. W. Alexander, member A. S. M. E., who has been so long identified with the educational work and the training of the apprentices at the works of the General Electric Co., West Lynn, Mass. The subject of the paper is "The Training of Men—A Necessary Part of the Modern Factory System."

On Tuesday evening, March 8, there will be a meeting of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers co-operating, in the Engineering Societies' building, New York, with a paper by H. G. Stott, member A. S. M. E., superintendent of motive power of the Interborough Rapid Transit Co., New York, and R. I. S Pigott, on "Tests of a 15,000-Kilowatt Steam Engine Turbine Unit." The paper relates to the installation of low pressure turbines at the Fifty ninth street station of the Interborough Rapid Transit Co., New York, and presents a discussion of the most important development in steam engineering since the commercial introduction of the steam turbine.

The Year Book for 1910 of the A. S. M. E. is issued in a form designed to embody the advantages of previous issues of the Year Book and of the Pocket List, a modified form of the Year Book, published in August. In its new form the Year Book contains both a complete alphabetical list of the membership, with information regarding the business, the membership of the society and other information.

The Phillips Sheet & Tin Plate Co. requests that all mail for that company be addressed to Weirton, Hancock Co., W. Va.

MAY NOT REBUILD

Bridge Plant at Milwaukee—Various Construction Projects.

Milwaukee, Wis., March 1.—The American Bridge Co. will not rebuild its Milwaukee plant, Seventeenth street and St. Paul avenue, destroyed by fire Jan. 3, according to present indications. J. C. Fruit, Milwaukee manager, said: "I have received no definite information about the intention of the company, but indications seem to be that the company will not rebuild." The site has been cleared and the steel scrap, etc., sold to the Illinois Steel Co.

The Racine Foundry Co., of Racine, Wis., recently incorporated for $40,000, will build a plant on Tenth street, near the Milwaukee road tracks, as soon as weather permits. The company is now occupying temporarily the old Chalmers foundry on Twelfth street, and is specializing in castings and parts for automobiles, but this will be extended to include all kinds of castings and pattern-building.

The Girnau Mfg. Co. has been incorporated at Eau Claire, Wis., with a capital stock of $25,000, by Peter Girnau, E. F. Boke and H. J. Schneider, to manufacture cement and concrete mixers. The company is now negotiating for suitable factory quarters.

Announcement is made that the Beaver Dam Foundry Co., of Beaver Dam, Wis., has resumed operation of its plant under new management. The company expects to enlarge the plant soon and is now ready to fill orders for gray iron castings.

The exterior work on the machine shop of the new forging plant of the Allis-Chalmers Co., at West Allis, has been completed. Sidetracks have been built into the structure and electric traveling cranes are now being erected.

Edward L. Wrattan, traffic manager for the J. I. Case Threshing Machine Co., of Racine, Wis., has resigned to accept the position of traffic manager of the Mitchell-Lewis Motor Co.

CANADA'S PRODUCTION OF PIG IRON.

The production of all kinds of pig iron in Canada for 1909, according to the returns received by the American Iron and Steel Association, amounted to 677,090 tons, compared with 563,672 tons in 1908. This was an increase of 113,418 tons, or over 20.1 per cent. In the first half of the year the production was 349,641 tons, and in the second half 327,449 tons. Of the total production, 660,856 tons were made with coke and 16,234 tons with charcoal and electricity. The production of basic pig iron was 357,965 tons, compared with 335,410 tons in 1908. The Bessemer pig iron output was 169,545 tons, compared with 112,811 tons in 1908. On Dec. 31, 1909, Canada had 16 completed blast furnaces, of which 11 were in blast and five idle. Of the total, 12 use coke for fuel and four use charcoal. In addition three coke stacks were being rebuilt on Dec. 31. In 1909 the Canadian furnaces consumed 1,311,796 tons of iron ore, 58,731 tons of mill cinder, scale, etc., and 470,080 tons of limestone.

ANNUAL REPORT OF AMERICAN BRASS CO.

The American Brass Co., Waterbury, Conn., in its annual report for the 12 months ending Dec. 31 last, shows net earnings through its various subsidiary concerns of $1,767,546, compared with $1,037,518 in 1908, and $1,303,249 in 1907. The total dividends received by the American Brass Co. from its subsidiaries in 1909 were $1,075,480, compared with $928,699 the previous year. The amount of dividends paid was $900,000 against $787,000 in the preceding year. The gross earnings for 1909 were $1,089,583; total expenditures, $1,061,957; leaving the surplus on the year's operations $27,626. The balance sheet of the American Brass Co. as of Dec. 31 was as follows:

Assets:	1909.	Changes.
Cash	$ 27,625	Inc. $22,646
Due from sub-companies	2,344,756	Inc. 11,000
Accounts receivable	59,399	Inc. 40,320
Birmingham Brass investment	108,161	Dec. 60,000
Sub-cos. capital stock investment	12,500,080	
Total	$15,040,023	Inc. $13,966
Liabilities:—		
Capital stock	$15,000,000	
Surplus	40,023	Inc. $13,966
Total	$15,040,023	Inc. $13,966

CUT NAIL PRICES.

At a meeting of the Cut Nail Association of Eastern Manufacturers, held at Philadelphia, on Feb. 23, it was unanimously agreed to strictly maintain the price of cut nails at $1.85, base Pittsburg, in car load lots; $1.90, base Pittsburg, in less than carload lots. Actual freight rate from Pittsburg to destination added. Usual terms.

The Princess, Va., furnace was lighted Feb. 15, after being out of blast some weeks for extensive repairs.

GOOD PROFITS

Made by Empire Steel & Iron Co.—High Grade Ore Mined.

The annual stockholders' meeting of the Empire Steel & Iron Co. was held in Jersey City, on Wednesday, Feb. 23. About 70 per cent of the stock was represented, and the retiring board of directors was re-elected for another year.

The annual report of the management was not given out for publication, but President Peckitt stated that the total net earnings from the operations amounted to $326,759.62, which, after making liberal allowance for improvements, permanent repairs and depreciation of mining properties, left a net profit for the year of $217,813.61. He also stated that during the year the full 6 per cent dividend had been paid on the preferred stock.

The mining properties in New Jersey turned out 215,063 tons of high-grade ore, far exceeding any previous year's output.

The present rated capacity of the furnaces is 300,000 tons per annum, but on account of business depression during the first half of the year, several stacks were idle. The total production of pig iron amounted to 171,400 tons. At the present time 88 per cent of the furnace capacity is in active operation.

Orders for pig iron are coming in at a fair rate, and the outlook for the future is encouraging.

The following is a condensed balance sheet of the company's affairs as of Dec. 31, 1909:

Assets:—		
Real estate, plants and machinery		$3,593,513.17
Stocks and bonds		1,071,869.30
Cash in banks	$ 229,674.25	
Notes receivable	169,000.00	
Accounts receivable	105,662.01	
Inventories—Pig iron	14,215.15	
Raw materials, supplies, etc.	409,982.09	
		$ 928,533.50
		$5,593,915.97
Liabilities:—		
Capital stock:		
Preferred	$2,500,000.00	
Common	1,254,770.00	
		$3,754,770.00
Accounts payable (current invoices)	$ 187,031.75	
Pay rolls	36,810.25	
Dividend No. 22—Payable Jan. 1, 1910	75,000.00	
		$ 298,842.00
Fund for depreciation of property	$ 614,721.76	
Fund for bad debts	17,001.65	
		$ 631,723.41
Profit and loss		908,580.56
		$5,593,915.97

The American Bridge Co.'s plant at Toledo, O., was seriously damaged by fire of unknown origin Feb. 26. The loss is estimated at $75,000.

ADDITIONAL SHOPS

Are to be Built at Beech Grove, Ind.—Hard to Get Machinists.

Indianapolis, Mar. 1.

The New York Central Lines have announced plans for spending an additional $1,000,000 in extending the Big Four railroad shops at Beech Grove, and the work is to start as soon as plans for the buildings can be prepared. Twelve new buildings are to be erected, as follows: Coach shop, 214 by 484 feet; dry kiln, 50 by 100 feet; paint shop, 180 by 444 feet; planing mill, 84 by 344 feet; freight car repair shop, 162 by 504 feet; freight car repair shop, 130 by 204 feet; miscellaneous shop, 62 by 400 feet; foundry building, 134 by 264 feet; wheel shop, 75 by 125 feet; stock shop, 84 by 104 feet; addition to power house, 48 by 116 feet; pattern shop, 65 by 195 feet; foundry supply buildings, 30 by 60 feet; oil house and concrete water reservoir. Most of the buildings will be of brick and steel construction.

The Enterprise Foundry Co. is planning to erect a new plant at Twenty-fourth and Yandes streets, where it has just acquired property, having a frontage of 400 feet in Twenty-fourth street and 650 feet in Yandes street. The consideration for the property was $16,000, and it is understood about $20,000 will be spent in improvements. The company is now located in South Senate avenue.

Stockholders of the Evansville Brass & Iron Bed Co., of Evansville, have decided to change the name of the concern to the Evansville Metal Bed Co., and the capitalization has been increased from $60,000 to $100,000, extensive improvements being contemplated.

The George M. Diehl Machine Co., which recently located in Wabash, is said to be having difficulty in finding experienced mechanics. The new factory building is practically completed and, it is said, enough orders are ahead to give steady employment to about 100 men. Reports from various parts of the state are to the effect that the growth of the automobile industry has made it practically impossible to get skilled workmen for other lines.

BETHLEHEM SHIPMENTS ARE NOT BEING DELAYED.

It is officially stated by the Bethlehem Steel Co. that the strike now in progress at its South Bethlehem, Pa., works has not affected the Saucon plant and that deliveries on Bethlehem structural sections will in no way be retarded by the trouble. A large number of contracts for Bethlehem sections are now being filled and fabricating interests have been somewhat concerned as to whether the strike situation would delay their shipments. It is stated that the present trouble involves only 1,200 men who have been employed in the No. 2 machine shop of the old Lehigh plant.

NEW SUPERINTENDENT OF ROLLING MILLS.

W. B. Trainer has been promoted from assistant superintendent of rolling mills at the Duquesne works of the Carnegie Steel Co. to superintendent of the rolling mills at that plant to succeed Carl F. Maeder, effective March 1. Mr. Maeder has resigned to become general manager of the Western Steel Corporation, at Irondale, near Seattle, Wash., and has severed his connection with the Carnegie Steel Co. after many years' service with that concern. Mr. Trainer has had several years' experience with local steel companies and has been assistant superintendent of rolling mills at Duquesne for several years. It is understood that a successor to Mr. Trainer will not be appointed for the present at least, and this title will likely be abandoned.

MEDAL IS PRESENTED.

Prof. Elihu Thompson was made the first recipient of the Edison gold medal at the annual dinner of the American Institute of Electrical Engineers, held at the Hotel Astor, New York, Feb. 24. The medal, which is provided for by the interest on a fund of $7,000 raised by the friends of Thomas A. Edison, is to be given each year to a man in the United States or Canada, selected by a committee of the American Institute of Electrical Engineers, as having achieved unusual distinction in electrical work. Among the congratulatory telegrams read at the dinner was one from Mr. Edison.

The plant of the National Motor Castings Co., Detroit, was sold Feb. 15, to William Christian, of that city, by the Security Trust Co. It is understood that Mr. Christian will continue the business at the present location.

The Railway Steel Spring Co. has declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable March 21.

FERRO MACHINE & FOUNDRY CO. TREBLED ITS SHOPS.

The Ferro Machine & Foundry Co., Cleveland, has just let contracts for an addition to the new machine shop which will practically double its capacity. The addition is to be a brick and concrete building 140 x 160 feet with basement under the entire building. The main floor will be principally devoted to the machine shop, with a portion for the foundry shipping department, and the basement will be used for a cleaning department for the foundry. Construction will be commenced at once, and is to be completed by May 15. With the completion of this building, the capacity of all departments of the Ferro shops have been trebled since last July, the additions since that time including the main machine shop, three stories and basement, 140 x 160 feet; a new concrete and brick core room, two stories and basement, 77 x 111 feet; a modern heating plant 24 x 50 feet; and the new extension of the machine shop just mentioned. The entire cost of these additions will approximate $300,000. The regular corps of workmen now numbers over 1,200. All the additions have been equipped with the most improved labor-saving machinery.

ROACH'S SHIP YARDS TO BE OFFERED FOR SALE.

The property of the Delaware River Iron Ship Building & Engine Works, at Chester, Pa., known as Roach's ship yards, will be sold at receiver's sale, Thursday, March 24, at 2:30 p. m. The sale was ordered by the county court on the petition of William I. Schaffer, of Chester, receiver for the works. The property will be sold subject to a lien of a mortgage for $100,000. It includes 37 acres along the river front, buildings, machinery, tools and fixtures. The plant has been idle for a long time. The receiver was appointed Nov. 12, 1908, after an equity suit was begun against the company by the Cambridge Trust Co., executor of the estate of John B. Roach. The indebtedness of the company at that time was placed at $542,913.11, not including a mortgage of $100,000 on the real estate.

CLEVELAND BRANCH.

The Domhoff & Joyce Co., Cincinnati, dealer in pig iron and coke, on March 1 opened a branch office at No. 1331 Schofield building, Cleveland. R. D. Jenkins will be resident manager of the office.

FOREIGN RAIL CONTRACTS PLACED ABROAD.

Rail orders aggregating about 70,000 tons have been placed by foreign railroads during the past week and there is considerable pending inquiry from the British colonies, including 18,000 from Canada, and 1,800 tons from Victoria. Among the orders placed this week were 7,000 tons for the India office to the Workington Iron Co., 33,444 tons for the Burma railways to the Barrow Hematite Co., 20,000 tons for the Great Western of Brazil to the Ebbw Vale Iron & Steel Co., and 5,000 tons for the Cape government to Russian works. Another recent order of importance awarded is for 9,000 tons to the Pekin-Palgan railway.

ROCKEFELLER RESIGNS.

John D. Rockefeller Jr. has resigned as a director of the United States Steel Corporation, and is succeeded by Henry Walters, of Baltimore, chairman of the Louisville & Nashville railroad, and the Atlantic Coast Line railroads. An authoritative statement issued gives as Mr. Rockefeller's reason for resigning that the holdings of stock in the corporation by the members of his family are not sufficiently large to justify his giving time or attention to its affairs.

BRANCH ANNUAL MEETINGS.

The annual meeting of local branches of the National Metal Trades Association will be held on the following dates:

Boston branch, March 2; Cincinnati, Cleveland and Rhode Island branches, March 3; Worcester, Mass., branch, March 4; New York and New Jersey branches, March 7; New Haven, Conn., branch, March 8; Indianapolis branch, March 11; St. Louis branch, March 15.

OPTIONS ON COAL LANDS.

Pittsburg, March 1.

Cleveland capitalists are said to have obtained options on about 10,000 acres of coal land in O'Harra, Indiana and Hampton townships, Allegheny county, Pa. It is understood that the prospective purchasers are considering plans for large coke operations on the big tract. The options, it is said, include the property of the Selwyn-Taylor estates, consisting of about 8,000 acres. The whole tract is between the Bessemer & Lake Erie and the Baltimore & Ohio railroads. The options on the farm lands were obtained at about $125 an acre.

LATE RAIL SALES.

New York, Mar 2. (By wire.)

Illinois Steel Co. reports rail sales of 16,000 tons domestic and 10,000 tons for Alaska. The Carnegie Steel Co. sold 1,000 tons. There is a strong demand for light rails. Lumber companies are buying heavily.

PERSONAL.

Philip Geier, of the Cincinnati Milling Machine Co., who was recently operated upon for appendicitis, is recovering steadily.

Archibald Johnston, vice president of the Bethlehem Steel Co., has returned from England and the continent where he had been for several weeks.

Frank P. Case, assistant general sales agent of the Carpenter Steel Co., has been appointed to a similar position with the Crucible Steel Co. of America, and will be located in Chicago.

William M. Hall, of Pittsburg, has been elected a director of the Consolidated Connellsville Coke Co., succeeding the late W. C. Magee. The former officers were re-elected.

J. J. Casey, superintendent of the Jefferson, Ind., plant of the American Car & Foundry Co., has resigned to engage in another line of business. H. A. McKnight has been appointed to succeed him.

Horace Brock and son, John Penn Brock, vice president of the American Iron & Steel Mfg. Co., of Lebanon, Pa., are spending some weeks inspecting steel plants in Germany. It is understood that the company is planning a steel plant at Lebanon.

Ephraim Smith, who has been the New England sales manager of the Colonial Steel Co. since the organization of the company in 1901, has been obliged by long-continued ill-health to resign his position. He has been succeeded by E. B. Fitzgerald, who has been representing the Boston offices with headquarters in Springfield, Mass., for the past five years.

OBITUARY.

William B. Barry, formerly engaged in manufacturing saws at Dayton, O., died at Indianapolis, Feb. 22, aged 69.

James A. Wheelan, aged 45, secretary of the Bourne & Knowles Mfg. Co., died at his home in Cleveland, suddenly, on Feb. 28.

John Jenkins, general manager of the plant of the Williamsport Iron & Nail Co., died in Milton, Pa., recently. He was formerly burgess and school director of Milton.

Amandes Sieger, a retired merchant and iron ore mine operator, died recently at his home at Siegersville, Pa. He represented his district in the state legislature from 1880 to 1884.

Ambrose H. Wells, president of A. Wells & Co., manufacturer of seamless metal tubing, president of the Waterbury Rolling Mills Co., and president of the Waterbury Battery Co., died at Waterbury, Conn., Feb. 16, aged 72.

Rex J. Dowd, for 30 years a manufacturer of knives at Beloit, Wis., died there recently. He was the first knife maker in the northwest, the business now being carried on by his sons, Glenville A. and Robert I. Dowd, under the style of The Dowd Knife Works.

George M. Summers died Feb. 26, at Youngstown, O., aged 64. For many years he was employed as a sheet mill roller in the plant of the Brown-Bonnell Iron Co., later becoming superintendent of the Mahoning Valley plant of the Republic Iron & Steel Co. At one time he was superintendent of the Lake Erie Rolling Mills at Cleveland, of the Republic Iron & Steel Co.

Charles N. Frost, president of the Frost Mfg. Co., Kenosha, Wis., and prominently connected with the brass industry of the United States for 50 years, died Feb. 27, aged 66. He was a native of Waterbury, Conn. In 1866 he went to Kenosha and became superintendent of the plant of the Chicago Brass Co. In 1902 he retired and organized the Badger Brass Mfg. Co., of which he was president for a number of years. Later, he organized the Frost Mfg. Co.

Prof. Amos Emerson Dolbear, a noted scientist and widely known as the inventor of improved telegraph and telephone appliances, died at Medford, Mass., Feb. 23. Prof. Dolbear was 72 years of age. After graduating from Ohio Wesleyan University in 1866, he became an instructor at that university and later at the University of Michigan. He was professor of physics at Tufts College from 1874 to 1902. Among his inventions are the writing telegraph, magneto and static telephone, spring balance ammeter, the converting of sounds into electricity and the photographing through a solid body with the aid of electric waves. Some people have credited Prof. Dolbear with being the inventor of wireless telegraphy.

Stock Market Goes Through Dull Week

Last week in the stock market was the dullest since last summer. Price changes were small and trading was generally professional.

Monday prices opened weak and lower and after a brief recovery again sold off. The Great Northern Ore Co. dividend of 50 cents a share was announced. Tuesday was a holiday. The bank of Englang shipped $2,500,000 in gold to Paris. Wednesday sales fell to 382,744 shares, the dullest of any day in many months. Prices averaged slightly lower and money was firmer. LaBelle Iron Co. announced an increase in its quarterly dividend to 2½ per cent. The Chicago Pneumatic Tool Co. resumed dividends. Thursday was another dull day, but grew more active toward the close. Prices were firm and somewhat higher. Call loans advanced to 3 per cent, and money was firmer in London. Friday was a somewhat better day. Prices closed lower again. Reading and Steel common made up nearly half the market, the activity in Reading being largely the work of a single trader on the floor. Saturday the market was dull and prices slightly weaker.

Money on call closed the week at 2½ per cent, the rate during the week fluctuating from 2 to 3 per cent. Time money was dull. Clearings throughout the United States were estimated at $2,725,783,478, against $3,569,144,211 the week before, and $2,706,148,974 the corresponding week of 1909. The actual report of clearing house banks showed loans increased $8,214,200; deposits increased $8,673,600; surplus decreased $3,202,200, and the ratio of reserve 26.7, against 26.8 the week before. Trust companies and non-member banks showed loans and investments increased $7,457,600; deposits increased $1,777,400; the percentage of reserve 17.5 against 17.4 the week before.

Exports of gold from the United States, reported through the custom house, were $1,075,000, of which $1,000,000 was shipped to Argentina. Imports of gold were $161,250. Failures for the week numbered 221, against 267 the week before, and 270 the corresponding week a year before. Liabilities in failures during February, up to Feb. 26 were $25,257,276, against $13,472,719 during the same period in 1909. The fortnightly report of the American Railway Association showed a decline of 10,666 in the number of idle cars during the first two weeks in the month, making the surplus of cars the smallest so far this year. Steerage arrivals at New York for the week numbered 14,174, against 10,547 the week before. During the year, there have been 79,091 steerage arrivals and 22,819 departures. Stocks sold during the week numbered 2,139,400, against 4,181,400 the week before, and 4,763,800 the corresponding week the year before. Bonds, other than government bonds, were sold to the value of $11,770,000 against $16,417,000 the week before, and $23,095,000 the corresponding week the year before.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. Feb. 26	Changes in week	Date 1910 Ann. M't'g.	Stock Outstanding	Basis	Dividend Last Dividend	Dividend Date Last Div. Pay.
Allis-Chalmers	12	— ½		$19,820,000			
Allis-Chalmers, pr	41	—1½		16,150,000	7 cum.	1¾ Q.	Feb., 1904
American Can	11½	.....	Feb. 2	41,233,300			
American Can, pr	75¼	—1½		41,233,300	7 cum.	1¾ Q.	Jan., 1910
Am. Car & Fdy	63	+ ¾	June 24	30,000,000		½ Q.	Jan., 1910
Am. Car & Fdy., pr	118¾	.....		30,000,000	7 n. c.	1¾ Q.	Jan., 1910
American Loc	50½	— ½	Oct. 18	25,000,000	5	1¼ Q.	Aug., 1908
American Loc., pr	111½	—1½		25,000,000	7 cum.	1¾ Q.	Jan., 1910
Am. Ship	77⅛	.....	Oct. 12	7,600,000	4	1 Q.	Mar., 1910
American Ship, pr	111½	+ ½		7,900,000	7 cum.	1¾ Q.	Jan., 1910
Am. Steel Foundries (new)	61	+ ½	Dec. 1	17,184,000		1¾ Q.	
Barney & Smith	40	.....	June 7	2,000,000	4	.....	Sept., 1907
Barney & Smith, pr	105	.....		2,500,000	8 cum.	1 Q.	June, 1908
Bethlehem Steel	30	+1½	April 5	14,862,000		.....	
Bethlehem Steel, pr	60	+3¼		14,908,000	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	49¼	+ ½	Mar. 15	45,000,000	5	2½ S. A.	Feb., 1910
Cambria Iron	47	.....		8,468,000*	4	2 S. A.	Apr., 1910
Chicago Pneumatic Tool	45¾	+1¾	Feb. 21	6,145,000	4	1 Q.	Apr., 1910
Colorado Fuel	39⅜	— ⅞	Oct. 17	34,235,500		1¾ Q.	April, 1902
Crucible Steel	15¼	+ ⅛	Oct. 19	24,578,400		3½	
Crucible Steel, pr	88	+ ⅝		24,436,000	7 cum.	1¾ Q.	Dec., 1909
Empire Steel	13	.....	Feb. 23	1.254,770		.....	
Empire Steel, pr	83	.....		2,500,000	6 cum.	3 S. A.	July, 1909
Fay & Egan	90	.....	Feb. 15	1,000,000	7	3 S. A.	Feb., 1910
Fay & Egan, pr	120	.....		1,000,000	7 cum.	1¾ Q.	Nov., 1909
General Electric	154	—2½	May 10	65,179,600	8	2 Q.	Apr., 1910
Harbison-Walker	35½	.....	Jan. 17	18,000,000		2 Q.	Oct., 1907
Harbison-Walker, pr	94	.....		9,600,000	6 cum.	1½	Oct., 1909
International Pump	48⅝	+ ¾	May 10	17,762,500		1 Q.	April, 1905
International Pump, pr	88	.....		11,350,000	6 cum.	1½ Q.	Feb., 1910
Lackawanna Steel	50	.....	Mar. 9	34 978,000		.....	.....
Lake Sup. Corp	24¼	— ½	Oct. 5	40,000,000		.....	.....
New York Air Brake	76	+ ¾	June 16	10,000,000	8	2 Q.	Oct., 1907
Niles-Bement-Pond	101	.....	Feb. 2	8,500,000	6	1½ Q.	Mar., 1910
Niles-Bement-Pond, pr	104	.....		2,000,000	6 cum.	1½ Q.	Feb., 1910
Otis Elevator Co	51	—2	Mar. 21	6,375,300	3	1½ S. A.	Oct., 1909
Otis Elevator Co., pr	99½	+1½		6,295,000	6 n. c.	1½ Q.	Jan., 1910
Pa. Steel	65	.....	May 9	10,750,000		.....	
Pa. Steel, pr	113½	.....		16,500,000	7 n. c.	3½ S. A.	Nov., 1909
Pittsburg Coal Co	20½	— ½	Mar. 8	28 104,600		.....	
Pittsburg Coal Co., pr	72⅜	+ ⅜		27,071,800	7 cum.	1¾ Q.	Jan., 1910
Pressel Steel Car	42½	— ½	Feb. 16	12,500,000		1 Q.	Aug., 1904
Pressed Steel Car, pr	101¼	— ¾		12,500,000	7 n. c.	1¾ Q.	Feb., 1910
Pullman	196	—1½	Nov. 9	100,000,000	8	2 Q.	Feb., 1910
Railway Stl. Spring	41⅛	—1⅞	Mar. 3	13,500,000	2	1 S. A.	Oct., 1908
Railway Stl. Spring, pr	101	.....		13,500,000	7 cum.	1¾ Q.	Dec., 1909
Rep. Iron & Steel	38	—2	Oct. 19	27,191,000		.....	
Rep. Iron & Steel, pr	101½	—1		20,416,900	7 cum.	1¾ Q.	Apr., 1910
Sloss Sheffield	76½	— ½	Mar. 9	10 000,000	5	2 Q.†	Feb., 1910
Sloss-Sheffield, pr	116⅛	.....		6,700,000	7 n. c.	1¾ Q.	Jan., 1910
U. S. Pipe & Fdy. Co	24½	—1¼	June 22	12,106,300	2	1 Q.	Dec., 1907
U. S. Pipe & Fdy. Co., pr	79½	.....		12,106,300	7 n. c.	1¾ Q.	Mar., 1910
U. S. Steel	80¾	+ ⅛	April 18	508,302,500	4 n. c.	1¾‡ Q.	Mar., 1910
U. S. Steel, pr	119¾	— ⅜		360,281,100	7 cum.	1¾ Q.	Feb., 1910
U. S. Steel, 5s	105¼	.....		463,798,000	5	.....	.....
Va. Iron, Coal & Coke	62¾	+ ¾	Sept. 20	9,073,680		.....	.....
Westinghouse Elec	71	+ ¼	July 27	27,173,200*		1¾ Q.	Oct., 1909
Westinghouse Air Brake	145	+1	Oct. 4	14,000,000*		4 Q.	Oct., 1909

†Includes deferred dividend of ¾ of 1 per cent.
Par value of shares, $100, except those starred (*), $50.
‡Includes ¾ per cent extra.

Copper Stocks.

New York.—Amalgamated Copper closed 76⅛, a decrease of 1¼.

Boston.—Butte Coalition closed 24¾, an increase of ¼; Calumet & Arizona closed 74¼, an increase of 1¼; Calumet & Hecla closed 640, no change; North Butte Mining closed 37½, an increase of 3½; Quincy Mining closed 88, a decrease of 1.

Financial Notes.

The Cumberland Ely Copper Co. has declared an initial dividend of 10 cents a share, payable March 30.

The American Brake Shoe & Foundry Co. has declared the regular quarterly dividend of 1¾ per cent on preferred stock, and the regular quarterly dividend of 1¼ per cent on common, and in addition an extra dividend of one-half of 1 per cent. Both dividends are payable March 31. This makes the distribution on common stock for the quarter at the rate of 7 per cent.

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March, 1909	5,396
April	5,508
May	5,533
June	5,551
July	5,572
August	5,597
September	5,609
October	5,628
November	5,634
December	5,662
January, 1910	5,681
February	5,703

March 3, 1910

THE SHEET STEEL INDUSTRY.

By a conservative reckoning, eliminating all plants not really active, there are in excess of 220 independent sheet mills in the United States, with 35 additional mills under construction, some of them almost completed, and two or three plants definitely projected, but not yet under contract. At the same time there are 94 regular tin plate mills active, with 32 additional nearing completion. This division classes as sheet mills certain mills which are technically tin mills, but do not tin their product and make fine sheet specialties.

There is a curious difference of alignment between the sheet and tin mills as to the production of steel. Of the sheet mills built and being built, exactly two-thirds are attached more or less directly to steel production. In a number of cases, the sheet mills and steel mills are under different corporate names, but the control is identical.

In the case of tin plate mills, the alignment is entirely different. None of the prominent producers of coke tin plates produces steel. The few tin mills which do have their own steel are manufacturers of specialties, particularly fine grades of terne plate and fancy charcoals. An exception is on the way, as the Jones & Laughlin Steel Co.'s new tin plate plant will make coke tins on a large scale, while the company is a prominent sheet bar producer. When the tin mills now being built are completed, there will be 126 regular tin plate mills, of which 43 will be attached to steel making plants, constituting barely one-third, while, as noted, two-thirds of the independent sheet mills are attached to steel plants.

The sheet mills are distinct in another sense. While they are in large measure independent as to their raw material, they are also in large measure independent of the ordinary sheet market, for many of them have large finishing departments, in which they produce various sheet products, such as expanded metal, eave trough and conductor pipe, metal lath, ceiling and siding, corrugated roofing and many other products, including even metal furniture in the case of one prominent sheet interest.

The increase in the number of sheet and tin mills is not, perhaps, as great as is generally supposed. There has been a great deal of new erection in the past few years, a fact which has been well advertised, but the failures have not attracted so much attention. There have been a great many wrecks, and even now there are several mills technically in existence, which are not included in the above totals. With 381 independent sheet and tin mills, built and being built at present, there were in existence more than 200 such mills seven years ago. Many of those have been lost to the reckoning.

The increase in productive capacity is not measured by the number of mills, for outputs per mill have greatly increased. This is well exemplified by the operations of the United States Steel Corporation. Its heritage from the original sheet and tin plate consolidations was a lot of mills, some of which were far below the standard set by the best. Seven years ago, it had 162 sheet mills and 264 tin mills. It has meanwhile added only 22 mills, yet has nearly doubled its sheet production. It has largely increased its production of tin plate, although it has reduced its tin mills to 235 in number. With the sheet and jobbing mills being built at Gary, the Steel Corporation will have a total of 435 sheet, jobbing and tin plate mills, and the capacity of these mills will probably be double the actual output of the 426 mills it had in 1902. A considerable portion of the gain, of course, is due to the elimination of the output limit of the workmen some five years ago, this having been the chief bone of contention between organized labor and the manufacturers. With some 380 independent mills built or being built, the prospective total for the country is about 815 sheet, jobbing and tin plate mills. They should have a capacity of fully 2,000,000 tons annually of their respective products, representing a remarkable growth in the past 20 years, for 20 years ago there was no tin plate made in the United States and the production of sheets was relatively very small. The time may come when the production of sheets and tin plate will pass the production of rails. In 1899, the year which broke the remarkable record for rail output made back in 1887, the output of wire rods was less than half the rail output, but in 1908 the wire rod production slightly exceeded the output of standard rails, both being below 2,000,000 tons.

SOME STRIKING TURBINE STATISTICS.

Accustomed as we think we have become to being "revolutionized" at intervals, the statements made and figures quoted in Mr. Parker's paper on steam turbine practice on another page, are something more than interesting: they are even bewildering. Not only in respect of the size or capacity of units, which has already reached a figure double that of the largest stationary reciprocating engines ever built and representing the farthest advance in the building of that type which has outlived all others and is today built in greater numbers than ever—the Corliss, but also in the complete revision, not to say de-

struction, of former rules of power-plant financing, and all this within a few years. Between the first engine of the Corliss type and the 10,000-horse-power masterpiece from the hand of Edwin Reynolds—the Interborough design—over 50 years elapsed; from the first practical turbine to the 20,000-horse-power Chicago and St. Louis units is little over a fourth as long. Mr. Parker, in only a few words, tells of lifting a 5,000-kilowatt turbo-generator set off its base, simply throwing it away, and on the same base and with the same connections installing another unit nearly two and one-half times as large. A volume of history is compressed within those few lines.

In foundation work alone the contract is illuminating. The foundations for the 12,000-kilowatt St. Louis units contain 1,700 cubic feet of concrete costing $700.00. The foundations under the Interborough engines, exclusive of that under the generator, and which should properly be included, have an area of 1,300 square feet and on a mean depth of 10 feet contain 13,000 cubic feet, a ratio per kilowatt of 12.3 to 1. In difficult situations with poor footing, the difference would in all probability be still more striking. If engines of 14,000-kilowatt capacity were commercially practicable, the ratio would doubtless be reduced, but the advantage in foundations and floor space must remain with the turbine.

There is nothing about the turbine which appeals to the imagination; in appearance it is a commonplace, almost undignified, and apparently inert, mass. Compared with the big Corliss with its steady, impressive movement, it is uninteresting, but it is full of business, and in the power house balance sheet there is nothing allowed for the poetry of motion.

RAIL PRODUCTION STATISTICS.

None of the estimates made of rail production in 1909 exceeded 3,000,000 tons, but the official statistics just made public by the American Iron and Steel Association show a total of 3,062,582 gross tons produced in the year.

Before discussing the statistics, a word of obituary for the iron rail is meet. More than 10,000,000 tons of iron rails have been produced in the United States. In 1907, the statistics reported 925 tons; in 1908, 71 tons; in 1909, not a single ton is reported. *Requiscat in pace.* There are still between 8,000 and 9,000 miles of steam railroad track in the United States laid in iron rails, and there is demand for iron rails for mining and other industrial purposes, on account of the facility with which they can be bent, but that demand is to be supplied by re-rolling old iron rails as they are taken up from steam railroad track. Production of new iron rails has ceased.

The history of rail production in the United States shows a series of swings quite distinct from the general progress of iron and steel manufacture, due to the spurts, first in railroad building and second in the replacement of old and light rails by heavy rails. The culmination of new railroad building in the United States was in 1887, when nearly 13,000 miles of new road was built. The same year naturally showed a high point in rail production, 2,139,640 tons, a total which was not exceeded until 12 years later, in 1899. The culmination of rail replacement was in 1906, when production totalled 3,977,887 tons. These special movements now give place to a more steady demand, for the building of a moderate amount of new track each year, for gradually replacing the iron rails and remaining light rails in track, for replacing rails which are merely worn out in service, for the building of electric lines and for general industrial and export purposes.

The earliest trustworthy statistics of rail production are for 1849, when 21,712 tons of iron rails were produced. At the beginning of that year there were about 6,000 miles of steam road in operation, so that there was probably considerable production before that time, but a large part of the 300,000 to 400,000 tons of rails involved was probably furnished by imports, of which there are no statistics until 1872.

The production of iron rails reached its maximum in 1872, with 808,866 tons, in which year 83,991 tons of steel rails were produced. Iron rail production suddenly became unimportant between 1882 and 1883, production dropping from 203,459 tons to 57,994 tons.

Our maximum importations of rails occurred in 1871, with 505,537 tons. Our large exports began suddenly, with less than 20,000 tons in any year prior to 1896, 73,131 tons in that year, 148,221 tons in 1897 and 301,903 tons in 1898. The record high exports were in 1904, 416,250 tons.

There have been produced in the United States to date about 59,300,000 tons of steel rails, and about 10,700,000 tons of iron rails, a total of just about 70,000,000 tons. Our total imports made in early years, and our total exports, made in late years, have just about balanced, each movement slightly exceeding 3,000,000 tons. As a rough approximation, there are about 50,000,000 tons of rails in service in the country, in steam and electric road, industrial works, etc. Practically all the iron rails have disappeared, or more than 10,000,000 tons of the total production. Roughly speaking, about 10,000,000 tons of steel rails have been worn out, the material going into other service, through reworking or remelting.

The estimates of 50,000,000 tons of steel rails in service and only 10,000,000 tons passed out of service may furnish room for surprise in some quarters. The fact is that it is only of late that rails, the country over, have begun to wear out rapidly. The density of traffic has been great only over comparatively small stretches of main line track, there being tens of thousands of miles where the duty is extremely light. The wear of rails, however, is growing apace. The total ton-mileage of freight movement in the United States in 1890 was only 77,200,000,000; in 1900 it was 141,000,000,000; in 1907 it reached 233,000,000,000, thus tripling in only 17 years, and it is certain to continue increasing apace. Ton-mileage, rather than total miles of track in service, furnishes the factor determining rail wear.

The gain in production of open-

hearth steel rails in 1909 is surprising, even though it has been well known that greatly increased productive capacity was available, for the production of open-hearth steel rails increased, 1908 to 1909, from 567,304 tons to 1,255,961 tons. The Gary plant was, of course, the principal factor, but Ensley doubtless furnished an increase, the Bethlehem tonnage became larger, and Lackawanna also furnished an increase, while one or two other rail interests furnished a tonnage of open-hearth.

The production of open-hearth rails first passed the 100,000-ton mark in 1904, production from that year being as follows:

1904	145,883
1905	183,264
1906	186,413
1907	252,704
1908	567,304
1909	1,255,961

A new feature of the production statistics is the detailed statement of the alloyed rails made in 1909. This was probably an inconsequential feature in previous years. Of the 1909 production, 50,505 tons are stated to have been alloyed rails, as follows:

Titanium	35,945
Manganese	1,028
Nickel-chrome	12,287
Nickel and electric	1,245
Total	50,505

Of this total, 36,809 tons were from Bessemer steel and 12,696 tons from open-hearth steel. It appears that the open-hearth is not necessarily the process for special treatment. Possibly the burden has been greater to improve the Bessemer rail than to improve the open-hearth rail.

SIR EDGAR'S VISIT.

Toronto, Mar. 1.

Considerable importance is attached to the visit of Sir Edgar Speyer, Bart., of the banking firm of Speyer & Co., London, Eng., now in Canada. He is in Canada for the purpose of acquainting himself with industrial conditions, in which his house is extensively interested, having invested $6,000,000 in the bonds of the Dominion Iron & Steel Co. He goes to Ottawa this week and before his return to England will inspect the properties of the Dominion Steel and Dominion Coal companies at Sydney, N. S. His visit is believed to be in connection with the merger of those companies.

NEW ENGLAND ASSOCIATION

Of Iron and Hardware Men Holds Seventeenth Annual Banquet.

Boston, Mar. 1.

The seventeenth annual banquet of the New England Iron and Hardware Association was held the night of Feb. 24, at the Hotel Somerset, this city, with an attendance of over 300 members of the association and invited guests present.

The president of the association, Augustus B. Marble, local agent of the Jones & Laughlin Steel Co., of Pittsburg, presided, and the toastmaster was the Hon. Joseph Walker, speaker of the Massachusetts house of representatives.

The special guests were the Hon. James Francis Burke, Republican member of Congress from Pittsburg, the Hon. Louis A. Frothingham, lieutenant governor of Massachusetts, Speaker Walker and the Rev. Dr. A. Z. Conrad, pastor of the famous Park street church of Boston.

Seated at the head table besides the special guests were Fred L. Greeley, of the Herrick Co., Boston; Charles F. Bragg, of the C. F. Bragg Co., Bangor, Me.; E. A. Loomis, of the Belcher-Loomis Co., Providence, R. I., and Oscar A. Shepard, of the Shepard-Clark Co., Boston.

Notable among the out of town guests were Col. H. P. Bope, of the Carnegie Steel Co., Pittsburg; Messrs. Roland Gerry and John L. Haines, of the Jones & Laughlin Steel Co., of Pittsburg, and Fred Krebs, of the Cambria Steel Co., of Pittsburg.

The banquet at 7 o'clock was preceded by an informal reception at 5:30, held in the parlors of the hotel.

Congressman Burke was the principal speaker of the occasion and he was preceded briefly by Messrs. Marble, Frothingham, Dr. Conrad and speaker Walker.

The committee on arrangements was: Roland H. Boutwell, chairman; W. A. Hopkins, G. M. Gray, F. L. Greeley, H. P. Converse, W. H. Dunning, E. Loring Richards and George J. Mulhall.

The reception committee in addition to those above named, included the following: Charles C. Lewis, Fred H. Butts, A. C. Harvey, Wilbur Sargent Locke, Oscar A. Shepard, Frank E. Bragg and Charles A. Adams.

President Marble in his introductory remarks appeared to strike the keynote of the sentiment of the organization when he said: "A few weeks ago, we closed a successful year in the iron and steel industries and all their allied lines. We are now entering another year with feelings of confidence that prosperity has come to stay, and that this year will be still more successful than the year just passed; unless this confidence is upset by the constant agitation and freak legislation of the congress which is now in session at Washington."

Congressman Burke's speech was in the main a plea for the expansion of American trade and a reaching out by the iron and steel men of New England as well as other parts of the country for the world commerce that should be theirs, especially in the great field in China. America would have to do this, he said, or in time Europe would become the banker of the world and the United States a mendicant knocking at her doors to borrow money. He urged also the insistence of the American nation upon the maintenance of the open door in China as being the only way to promote our trade in that country and of securing a square deal with the other nations in the vast development of that country. He spoke especially upon the recent capturing by the Fore River Shipbuilding Co., of Quincy, Mass., of the $22,000,000 contract for the two battleships of the dreadnought type to be built for the Argentine Republic, citing this as an instance of the commercial awakening of the country along foreign expansion.

MAY BUILD IRON WORKS.

It is announced from Victoria, B. C., that Mackenzie & Mann, Vancouver and Victoria, backed by J. P. Morgan & Co., have purchased the Vancouver island coal mines owned by the Dunsmuir interests and known by the general name of the Wellington collieries, for the sum of $11,000,000 cash. The mines included in the deal produce some of the best coal mined on the Pacific coast, including high grade bituminous steam, domestic and coking coals. It is announced that Mackenzie & Mann will spend $5,000,000 on improvements to the property, including the erection of iron works, although no details are yet available.

TO HANDLE FREIGHT.

In pursuance of the policy of expanding the plant of the Maryland Steel Co., at Sparrows Point, an order for two new six-wheel locomotives has been placed. This makes 19 locomotives for operation within the enclosure, the increase in the amount of ore and finished product handled requiring more motive power. There are now about 30 miles of trackage at Sparrows Point. The company owns about 1,000 cars, including 500 hoppers in which coal is brought from the mines.

AMONG MACHINERY MAKERS.

PITTSBURG.

February Business Shows a Decided Gain Over That of January.

Office of THE IRON TRADE REVIEW, 510 Park Building, Mar. 1.

Official reports show that the machinery business in the Pittsburg district during the month of February was heavier than in January. Spring business, which has been held up for some time on account of weather conditions, is now coming out. A statement issued by the Westinghouse Electric & Mfg. Co. shows that the amount of orders booked during the month of February was approximately $3,000,000. This exceeds the January record by a large margin. A visit to East Pittsburg resulted in obtaining the information that operations in all departments are being well maintained, and, that, while single orders are not exceptionally large, the aggregate number shows a healthy condition of the business at the present time. During the last few weeks, there has been a great demand for large turbo-generator units and railway apparatus in general.

Negotiations are said to be under way whereby the Best Mfg. Co., of Pittsburg, is to lease the plant of the Crane Co., of Chicago, at Oakmont, Pa., near Pittsburg. The big buildings have never been used. They were erected with a view of merging the Best and Crane companies, the Best company to operate them as the eastern branch of the Crane concern. Suddenly the work at Oakmont stopped, and the buildings have since been idle. In event of the buildings being leased to the Best company, it is understood the latter will move to the Oakmont plant and abandon the Pittsburg shops.

George J. Hagan, furnace engineer, has received a contract from the Sligo Iron & Steel Co., of Connellsville, Pa., for the erection of one coal-fired Faggott heating furnace. This makes the third contract for similar furnaces from this concern within the last six months.

The West Leechburg Connecting Bridge Co. has been incorporated with a capital stock of $10,000. The incorporators are, A. Hicks and Lewis Hicks, Pittsburg; James B. Kifer, E. H. Beale, S. J. McCabe, Clifford A. Beale, Joseph E. Beale and J. A. Armstrong, of Leechburg, Pa.

Samuel W. Hays' Sons have sold to the Union Spring & Mfg. Co., New Kensington, Pa., a No. 5½ Piqua high pressure blower direct connected to a 75-horsepower Westinghouse motor, and a No. 6 blower, direct connected to a 100-horsepower Westinghouse motor, to the Duquesne Steel Foundry Co. Both installations are for steel converter service.

The New Kensington Motor Co., New Kensington, Pa., has been chartered with the following incorporators: J. W. Vernam, New Kensington; J. E. McKee, Ambridge, Pa., and J. G. Silvens, Homestead, Pa.

A certificate allowing the National Supply Co., of Toledo, O., to carry on business in West Virginia has been signed by Secretary of State Reed. James H. Barr, of Pittsburg, is president of the company, and Charles R. Clapp, of Toledo, is secretary.

Several of the coal companies in western Pennsylvania and West Virginia are entering the market for machinery and tools to be used in extension of present plants and opening of new fields. The railroads are also buying some machinery, although most of the big orders are being held up.

NEW YORK.

Good Small Buying in Machine Tools —Crane Inquiry Less.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., Mar. 1.

The week in the machine tool market has not developed any additional large lists, but it has shown a continuation of the buying of small lots and single machines which is making a very favorable aggregate of business. The automobile makers and allied industries are still giving the market consistent support, although the season for this class of orders is now nearing a close. Makers of milling machines as a result of this patronage are sold up far ahead and their shop operations are on a full basis. In some of the other lines, however, there is still a lack of aggressive buying, but the demand is showing a tendency to expand. Some railroad lists are still pending, but these are largely from western roads. Machine tool business entered by local houses in February will probably not show as large a total volume as in January, but this is rather due to the shorter month and to the influence of several holidays rather than to any falling off in demand.

There has been some falling off in the inquiry for cranes and hoists during the past several weeks in sympathy with the doubtful note sounded in the general business situation but builders have enjoyed good conditions during the past six months and are in comfortable positions at present. This is reflected in deliveries which, with representative makers, now range from two to four months. Present pending business is largely in single machines and there are no large inquiries actually in the market.

Industrial locomotives are moving fairly well, but the railroads are still slow to place orders for new motive power as they are not wholly free of the effects of having carried so much idle capacity on tracks through the depression. The car situation is improving in some degree and some important actual inquiries were circulated the past week, including those for steel freights by the Southern railway and for a large list of passenger coaches by the Harriman lines.

Some large contracts for machinery and mechanical supplies are now being placed for the Panama canal work. At the present time bids have gone in on an assortment of gate valves, operating mechanism, structural steel work for locks, castings, etc., amounting to about $150,000. This is the second of the large contracts of its kind opened to bidding by the Isthmian commission, the former one having been taken by the United Engineering & Foundry Co., Pittsburg. The commission now has out a circular calling for proposals upon hoisting engine, pumps, motors, spiral-riveted pipe and fittings, foot valves, dredging sleeves, push cars, revolving screen sections for rock crushers, steel, iron, switches, track frogs, tie plates, angle bars, track bolts and spikes. This will close March 21.

The Willimantic Machine Co., Willimantic, Conn., maker of silk and thread machinery, has purchased a tract of land in that city for extensions which will be made in the near future.

The Maddox Foundry & Machine Co., Archer, Fla., is about to begin the erection of additions to its plant which will include extensions of 40 x 118 feet to its machine shop, 30 x 40 feet to its pattern shop, and 30 x 40 feet to its blacksmith shop. The company will be in the market for pattern shop machinery, hand traveling

crane, pulleys, ring oiling boxes, roofing, etc.

The Davis Foundry Co., of Edgewater, N. J., has been incorporated with a capital stock of $25,000 to engage in the foundry and machine business. W. J. Allen is secretary of the company.

The Philadelphia Roll, Milling & Machine Co., Philadelphia, is having plans prepared for a machine shop which will be 83 x 116 feet in dimensions.

The Hudson & Manhattan Railroad Co. has awarded contracts for the erection of repair shops at Jersey City. The structural work will be done by the Riter-Conley Mfg. Co., Pittsburg.

The Keppler-Fox Foundry Co., Philadelphia, is having plans prepared for a four-story warehouse, 33 x 64 feet.

Sax & Abbot are contemplating the erection of a new file shop at Tacony, Philadelphia. The shop will be two stories in height and 44 x 179 feet in dimensions.

The inauguration of what will eventually be a program of enormous expenditures for harbor improvements at Jamaica bay, has been made in the appropriation of $1,000,000 by the city of New York for dredging the inner channels. This may involve large expenditures for the rebuilding of railroad terminals and other new construction, and will, in the end, entail a cost of probably $10,000,000. In this connection the Long Island railroad is planning an outlay of $3,000,000, which will include new yards, eliminations of grade crossings, new station facilities, etc.

The Baird Machine Co., of Oakdale, Conn., has acquired a tract of land at Thomaston, Conn., and will use the property as the site for a new plant. A machine shop is contemplated.

CINCINNATI.

New Booking Along General Machinery Lines Not Wholly Satisfactory.

Office of THE IRON TRADE REVIEW,
N. E. cor. Fourth and Elm Sts., Mar. 1.

Machine tool builders continue to be quite busy on old orders, and have sufficient work ahead of this description to last them for several months. New bookings, however, are not showing the activity along general lines that could be desired, yet it is apparent that there will be some increase over January production. Foreign inquiry is very light, and unsatisfactory, and is confined largely to certain lines of special machinery in the interest of automobile industries. Cincinnati makers of machine tools have become well and favorably known in foreign markets, and it is a safe prediction that when the reaction in trade takes place it will be found that the product of Cincinnati manufacturers will be among the first to respond to the call.

A number of out-of-town visitors have signified their intention to attend the annual meeting and dinner of the Cincinnati branch of the Metal Trades Association, March 3. Acceptances have been received from the Lima Locomotive Machine Works Co., Lima, O., and from Muncie, Ind. Assistant Secretary Manley has received an invitation from the New Haven branch to be present at its meeting, March 8, and address the meeting. A number of American manufacturers of machinery, among whom is the J. A. Fay & Egan Co., of this city, are much surprised over cable advices to the effect that the German government is said to be unwilling to lend its moral support to the American Machine Manufacturers' Exposition.

The Ohio Hardware Association, which met in annual session at Toledo, during the week, voted to hold its meeting in 1911 in Cincinnati.

The Laidlaw-Dunn-Gordon Co. will proceed at once with the erection of two large buildings, for foundry and machine purposes. These buildings will be of steel construction, and will cost in the neighborhood of $80,000.

The Findlay Carriage Co., Findlay, O., will increase its capital stock from $50,000 to $150,000 to engage in the manufacture of automobiles. New buildings have already been erected for the new business.

The C. W. Raymond Co., Dayton, O., manufacturer of clay molding machinery, has made plans for a new $150,000 factory building. It will be of brick and steel construction, and will contain the latest improved machinery.

The Franklin Automobile Co., a large concern, with main factories at Syracuse, N. Y., has established a general branch in Cincinnati, which will control a number of the surrounding and southern states, adjacent to the territory covered by its Alabama branch.

The Lane & Bodley Co., builder of stationary engines, advises that contracts have been made with a wrecking company to have the old building formerly occupied by the company at John and Water streets, torn down. The present plant of this concern is located at Bond Hill, O., and is a model up-to-date plant.

The Bennett Steel Furnace Co., manufacturer of furnaces, at 4029 Hamilton avenue, this city, has filed a deed of assignment. The assets are estimated at $5,000 and the liabilities at $8,718.49. Lack of capital is given as the cause.

CLEVELAND.

Business is Satisfactory and the Outlook is Reported Bright.

Office of THE IRON TRADE REVIEW,
Browning Building, Mar. 1.

Reports from a number of concerns in the machinery business and allied lines of manufacture are nearly unanimous in declaring that present conditions are satisfactory while inquiries point to continued and increasing activity.

The Cleveland Twist Drill Co. has found its business rapidly increasing during the last three months and is now unable to make prompt delivery upon orders. Much of the activity of this concern is due to the demand from automobile builders who are at their busiest season turning out cars for next season's trade, and it is admitted by makers of drills that the unusually brisk demand at this time cannot continue after the rush of automobile manufacturing ceases. The demand from the hardware trade for drills is also good at this time.

The Canton Foundry & Machine Co. reports that orders in its various lines have not been so brisk as in the fall, but inquiries are plentiful and the company expects to be making record sales soon. The company builds, among other things, special hammers for use in the manufacture of automobile bodies and the inquiries in this line are specially gratifying. These hammers have to be made from special designs to suit the needs of each customer. The season is approaching also when the demand for alligator shears made by this company for use in scrap yards will appear.

The Van Dorn & Dutton Co., manufacturer of gears and pinions for electric railway motors, is running day and night to keep up with orders. Considerable new machinery has been added to the plant recently.

The Ohio Blower Co., which has among its specialties a steam and oil separator, is having a busy season in that and other lines. Among recent orders was one for a 12-inch separator for shipment to Yokohama, Japan; a 24-inch separator for the Eastern

Pennsylvania Railways Co., Palo Alto, Pa.; a 12-inch separator for the New Jersey Zinc Co., Franklin Junction, N. J., and a 14-inch exhaust head for the Ayre Cotton Mills Co., Lawrence, Mass.

The W. W. Sly Mfg. Co., foundry equipment, has completed a series of experiments and tests with some new sand blast equipment and is well pleased with the results. A number of orders have already been received for sand blast mills and sand blast machines.

The East Iron & Machine Co., Lima, O., has been obliged to increase its shop facilities to take care of an increased demand for its one-car asphalt plants for which there is a growing demand. Orders for this form of equipment are running about five times as large as ever before in the history of the company.

The DeForest Sheet & Tinplate Co., Niles, O., in order to improve its facilities for the manufacture of electrical steel and pickled and cold rolled sheet steel, is equipping its annealing department with appliances for recording and maintaining uniform temperatures. All of the appliances were made by the company from designs worked out by its own engineering department.

The Bruce-Macbeth Engine Co. reports a good run of business and a large number of inquiries upon which it expects to close. Recent sales by this company include 135-horsepower engines to the Excelsior Shoe Co., Ironton, O., and the Fostoria Glass Co., Moundsville, W. Va., and a 115-horsepower engine to the W. W. Sly Mfg. Co., Cleveland.

The P. A. Geier Co., manufacturer of instruments of precision and high grade machinery has recently built an addition to its shop and added new machinery. The company is at work on a number of large contracts for automobile concerns.

The Burke Machinery Co., manufacturer of machine tools, is now completely installed in its new shop. in Conneaut, O., having moved there from Cleveland. The new plant is a two-story brick building with basement 47 x 156 feet. The company is now from 60 to 90 days behind on orders, but with its new facilities expects to have a stock of tools on hand by next summer. A new boring and facing machine will be put on the market later.

The share of the late William Kershaw in the City Machine Co., Cleveland, has been purchased by E. J. Kershaw, senior partner in the firm, and he will carry on the business as in the past.

BUFFALO.

Business is Being Turned Away by Makers of Machinery.

Office of THE IRON TRADE REVIEW,
932 Ellicott Square, Mar. 1.

The general business situation in the machinery trades throughout the state is excellent. Reports of crowded conditions at the works are not exaggerated, as a remarkably large amount of business is being turned away, shops being unable to guarantee deliveries. This is found to be especially true in Buffalo, Albany, Rochester and Syracuse. It is believed this will be followed by considerable factory and machine shop building, until recently not thought of. Machine builders are looking into the stability of the present conditions carefully with a view of increasing facilities if they find the outlook for a continuation of heavy business good.

The chief project here is the plan of the New York Central Railroad and the Lehigh Valley Railroad to spend about $10,000,000 in the improvement of its Buffalo freight and passenger terminals. The state public service commission now has in its posession the plans of the railroads and will lay them before the Buffalo authorities for consideration. Tentative plans involving the expenditure of several millions for like improvements have been prepared by the Lackawanna and Erie railroads.

Several large orders for automobile engines and motor truck engines have been placed with various gas engine builders recently, including orders taken by the F. A. Brownell Motor Co. of Rochester and H. L. F. Trebert, also of Rochester. A testing room with latest equipment has been added to the Brownell plant.

The Gleason Works of Rochester, which materially increased its facilities by building another large factory in that city during 1909, is operating to the limit of capacity including the new plant and lately has worked day and night shifts.

Authority has been granted to the Niagara Falls Power Co. to execute and deliver its refunding general mortgage to secure the $20,000,000 coupon and gold bonds of the company, and to issue $9,074,000 refunding bonds. The Niagara Falls Power Co., has extensive improvements under consideration.

In the shops of C. N. Cady, at Canastota, N. Y., a unique feat was performed a few days ago. Mostly automobile engines are built in the Cady shops and to settle a friendly wager an engine was produced from the pig iron in one working day. The Cady shop is not large, but it is complete from the foundry to the testing room. The engine built was a single-cylinder 4 horsepower motor. Mr. Cady directed the work from the melting of the pig and making the cores to testing out the finished machine.

The James Fitt Machine Co. has been incorporated at Rochester, capitalized at $10,000. Directors are James Fitt, Charles P. Bryan, George S. Bryan and Walter Copsey.

J. H. Mallinson has sold his engine and machine shops known as the Economic Engine Works of Utica, N. Y., to Abraham Bradley, who continues the old business.

The Valley Boat & Engine Co., Baldwinsville, N. Y., is finishing the construction of a new plant at Saginaw, Mich., and the business now carried on at Baldwinsville will be entirely moved to Saginaw in April.

LARGE BODY OF ORE FOUND ON MARQUETTE.

The discovery of a large body of ore in the district about ten miles west of Ishpeming on the Marquette range has been announced by George J. Maas, of Negaunee. Mr. Maas with a number of associates acquired control of a large acreage in the region some years ago and began diamond drilling on part of the land. In the 40-acre tract lying next west of M. A. Hanna & Co.'s American mine, ore was encountered close to the line of the American mine and at a depth of 383 feet. It is said to run 66 per cent iron and 0.045 phosphorus. This is a hard specular ore and the drill passed through 20 feet of it. Next, to the depth of 500 feet, the formation is a mixture of specular ore and jasper and then follows 72 feet of hematite, declared to be of Bessemer quality. Below this there is a dyke 10 feet in thickness and below to a point 626 feet beneath the surface the drill was again in hematite. There have been 21 drill holes put down in the property and Mr. Maas figures that he has found about 15,000,000 tons of ore to say nothing of the mixed ore and jasper which he believes can be concentrated.

Mr. Maas and his associates control acreage extending about two miles westward of their present discovery and they are hopeful that an extended campaign of drilling, which they contemplate, will result in still further discoveries.

DETAILED FIGURES ON IRON ORE SHIPMENTS

Confirm Expectations as to Record Breaking Character of the Season of 1909 — Mesabi and Gogebic Ranges Show Large Gains, While Other Ranges Are Somewhat Short of 1907 Output

Returns from all the iron mines in the Lake Superior district showing ore shipments for the season of 1909, with comparisons for previous years, are presented in a supplement to this issue. The table includes the mines in the Mayville district in Wisconsin, and shows that there was forwarded by lake and rail 42,586,869 tons of ore, of which 41,683,599 tons were shipped by lake and 903,270 tons by rail. This total for the lake shipments does not include 170,065 tons shipped from the Helen mine for the Lake Superior Corporation at Michipicoten.

The total for the year was the highest ever reached in any season on the Lake Superior ranges, being greater than the shipments for 1907, the previous record year, by 320,201 tons. The lake shipments for the year were greater than those of 1907 by 394,844 tons. These figures are about those that were expected at the close of the season. The comparisons with 1908 are, of course, vastly in favor of the year just passed, as the depression in 1908 caused a falling off of shipments for that year to 26,014,987 tons, which it will be noticed is considerably less than the 1909 shipments from the Mesabi range alone, but the comparisons are interesting, nevertheless, as illustrating the marvelous capacity of the Lake Superior ranges for responding to the demands of the iron trade. The difference in favor of 1909 is 16,571,882 tons, and this excess alone is greater than the total shipments of all the ranges 12 years ago. The increase in the 1909 shipments amounted to about 64 per cent of the shipments in 1908. The Marquette and Menominee ranges' shipments returned to about the normal, though neither range quite equalled the shipments in 1907. The Gogebic, with 4,088,057 tons, nearly doubled the total of its 1908 shipments, and exceeded any record ever made on that range, the previous high record having been made in 1905, when 3,705,207 tons were sent down. The Vermillion range made a good gain over the 1908 shipments, but did not reach its normal, nor did it equal its shipments in any year between 1896 and 1907. This comparatively poor showing from the Vermillion was not due to any failure in the mines, as much larger shipments could have easily been made had the Steel Corporation seen fit to work the mines to their capacity.

An examination of the table will show that all of the gains in 1909 over 1907 were contributed by the Go-

Shipments by Mines.

MESABI RANGE.

Adams	1,829,372	La Rue	365,543
Adriatic	107,317	Laura	178,110
Agnew	151,536	Leetonia	553,162
Albany	368,057	Leonard	6,857
Bessemer	227,767	Lincoln	303,066
Biwabik	542,821	McKinley	89,981
Bray	65,514	Mahoning	1,561,893
Brunt	14,212	Malta	92,356
Burt	1,660,101	Mariska	77,690
Canisteo	85,505	Miller	277,119
Chisholm	314,597	Minorca	119,154
Cincinnati	4,537	Mohawk	216,291
Clark	484,512	Monica	7,614
Commodore	409,148	Monroe	147,521
Corsica	135,366	Morris	1,831,187
Crosby	183,470	Myers	193,698
Croxton	159,038	Nassau	11,940
Cyprus	107,685	Onandaga	59,389
Duluth	150,501	Pearson	68,683
Elba	224,202	Perkins	59,029
Euclid	82,627	Pettit	83,548
Fayal	1,879,357	Sellers	626,169
Forest	6,304	Seville	23,585
Fowler	99,892	Shenango	831,099
Franklin	51,393	Sliver	256,073
Gilbert	783,683	Spruce (Cloquet)	579,903
Glen	396,591	Stevenson	1,030,742
Hanna	238,873	Susquehanna	243,049
Hawkins	316,783	Syracuse	5,509
Hector (Hale)	30,726	Tener	256,384
Higgins No. 2	322,504	Troy	86,520
Holman	391,157	Utica	201,480
Hull-Rust	3,039,911	Victoria	113,305
Iroquois	152,510	Virginia (Group)	1,843,450
Jennings	10,477	Wacoutah	60,966
Jordan	12,754	Wills	3,440
Kellogg	165,458	Winnifred (Day)	84,614
Kinney	287,421	Yates	5,362
Knox	7,464	Yawkey	45,790
La Belle	27,216		
Larkin (Tesora)	46,651		
Total			28,176,281

GOGEBIC RANGE.

Anvil	22,927	Ironton	277,594
Ashland	259,612	Mikado	99,195
Atlantic	124,845	Montreal	191,611
Brotherton	103,090	Newport	1,008,354
Cary (and Superior)	224,251	Norrie Group	977,054
Castile	26 982	Ottawa (Odanah)	100,223
Colby	170,095	Pike	22,174
Eureka	115,662	Sunday Lake	93,712
Harmony (Germania)	152	Tilden	154,506
Iron Belt	44,560	Yale (West Colby)	71,458
Total			4,088,057

MISCELLANEOUS. (In Wisconsin.)

Iron Ridge	15,955	Mayville	66 804
Total			82,759

MENOMINEE RANGE.

Aragon	246,984	Great Western	112,747
Baker	45,003	Groveland	24,933
Baltic	174,426	Hemlock	112,481
Berkshire	34,295	Hiawatha	136,739
Bristol (Claire)	396,825	Hollister	25,842
Caspian	189,023	James	90,851
Chapin (Ludington)	587,647	Lincoln	1,657
Chatham	68,730	Loretto	96,613
Clifford	103,626	Mansfield	118,713
Commonwealth	50,787	McDonald	1,144
Crystal Falls	986	Millie (Hewitt)	10,887
Cundy (Quinnesec)	5,512	Munro	23,241
Dober (Riverton)	171,200	Penn Iron M'ng. Co.	428,004
Dunn	193,396	Pewabic	465,453
Florence	231,191	Quinnesec	3,147
Fogarty	77,356	Saginaw (Perkins)	19 994
Genesee (Ethel)	65,585	Tobin	359,668
Gibson	36,246	Youngs	154,150
		Zimmerman	10,303
Total			4,875,385

MARQUETTE RANGE.

American (Sterling)	90,001	Lillie	61,708
Austin	125,858	Lucy (McComber)	1,672
Beaufort (Ohio)	72,987	Maas	159,197
Breitung Hem. No. 2	129,673	Mary Charlotte	240,433
Cambria	136,815	Negaunee	312,217
Champion	11,199	Portland	79,652
Cleve'd-Cliffs Group	877,433	Princeton (Sw'nz'y)	42,934
Empire	108,993	Queen (Blue)	237,509
Hartford	250,680	Republic	176,575
Imperial	115,478	Richmond	102,566
Jackson	11,060	Rolling Mill	133,139
Lake Angeline	280,298	Stegmiller	39,869
Lake Superior	349,435	Stephenson	64,075
		Washington	44,716
Total			4,256,172

VERMILLION RANGE.

Pioneer	477,226	Soudan (Minnesota)	74,862
Savoy	83,167	Zenith	321,951
Sibley	151,009		
Total			1,108,215
Grand Total			42,586,869

SHIPMENTS BY RANGES, GROSS TONS.

	1909	1908	1907	1906	1905	1904
Marquette range	4,256,172	2,414,632	4,388,073	4,057,187	4,215,572	2,843,703
Menominee range	4,875,385	2,679,156	4,964,728	5,109,088	4,495,451	3,074,848
Gogebic range	4,088,057	2,699,856	3,637,102	3,643,514	3,705,207	2,398 287
Vermillion rangs	1,108,215	841,544	1,685,267	1,792,355	1,677,186	1,282,513
Mesabi range	28,176,281	17,257,350	27,495,708	23,819,029	20,158,699	12,156,008
Miscellaneous	82,759	122,449	95,790	144,589	132,001	94,042
Total	42,586 869	26,014,987	42,266,668	38,565,762	34,384,116	21,849,401

SHIPMENTS BY PORTS AND ALL-RAIL, GROSS TONS.

	1909	1908	1907	1906	1905	1904
Escanaba	5,747,801	3,351,502	5,761,988	5,851,050	5,307,938	3,644,267
Marquette	2,909,451	1,487,487	3,013,826	2,791,033	2,977,828	1,907,301
Ashland	3,834,207	2,513,670	3,436,867	3,388,106	3,485,344	2,288,400
Two Harbors	9,181,132	5,702,237	8,188,906	8,180,125	7,779,850	4,566,542
Gladstone	.....	.....	.....	.....	.....	553
Superior	6,540,505	3,564,030	7,440,386	6,083,057	5,118,385	4,169,990
Duluth	13,470,503	8,808,168	13,448,736	11,220,218	8,807,559	4,649,611
Total by lake	41,683,599	25,427,094	41,288,755	37,513,589	33,476,904	21,226,664
Total by rail	903,270	587,893	975,959	1,052,173	907,212	622,737
Total	42,586 869	26,014,987	42,266,668	38,565,762	34,384,116	21,849,401

gebic and Mesabi ranges. On the Mesabi, after the season was once fairly under way, shipments proceeded with great activity, with the result that the 1908 record was exceeded by over 10,000,000 tons, and the 1907 record by about 800,000 tons. As was to be expected, the United States Steel Corporation was by all odds the largest shipper from the range, but it did not quite maintain its former position. In other years, the Corporation has sent down as much as 56 per cent of all the shipments from the ranges, but this year its total shipments are only a trifle greater than 50 per cent, or, to be exact, 50.36 per cent. In 1908, only three mines shipped more than 1,000,000 tons, but in 1909, nine mines are found in this exclusive circle of big producers. They are the Adams, Burt, Fayal, Hull-Rust, Mahoning, Morris, Stevenson and the Virginia or Oliver group on the Mesabi, and the Newport on the Gogebic. Of these mines, the Hull-Rust is the leader, with 3,039,911 tons, being more than a million tons ahead of its closest rival, and eclipsing all previous records for any iron mine on the Lake Superior ranges, and doubtless for any mine in the world. During the season the Fayal mine took the leadership of the Mesabi range in point of total shipments, having sent down at the end of the season a total of 18,132,550 tons, passing the record of the Mountain iron mine, which was 17,198,871 tons. This change in the relative positions of the mines is made possible by the shut-down of the Mountain Iron, from which no shipments were made during 1909, and only a very small shipment in 1908. The Mountain Iron is by no means worked out, but active work there has been discontinued for business reasons. The total shipments of the Fayal do not equal the totals of two of the old range mines or groups, but the much greater periods over which the old range mines have been operated make the Mesabi totals considerably more significant.

A number of new properties appear on the table this year. Descriptions of most of these properties have already appeared in THE IRON TRADE REVIEW. Among the new mines are the Syracuse, Pearson, Euclid, Perkins and Bray on the Mesabi range; McDonald on the Menominee, and the Stegmiller on the Marquette. This latter mine is a property of the Steel Corporation, which for some unaccountable reason, has been spoken of in recent publications as the Brotherton, but it has no connection with the famous Brotherton mine on the Gogebic range. All of the figures given in the total were compiled from original sources, and verified and corrected by comparison with the figures supplied by all railroads handling ore in the iron regions. Thanks are due to all of those who co-operated with THE IRON TRADE REVIEW in the production of the table by supplying these figures.

RAIL PRODUCTION

Of United States Showed increase of 59.3 Per Cent in 1909.

The production of all kinds of rails in the United States in 1909 amounted to 3,062,582 tons, against 1,921,611 tons in 1908, an increase of 1,140,971 tons, or over 59.3 per cent, says the Bulletin of the American Iron and Steel Association. The production in 1907 was 3,633,654 tons. Rails rolled from purchased blooms, crop ends, scrap, and "seconds," and rerolled and renewed rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. In the following table the production of all kinds of rails in 1909, 1908 and 1907 is given. The maximum production of all kinds of rails was reached in 1906, when 3,977,887 tons were rolled.

States. Gross tons.	Bessemer.	Open-hearth.	Iron.	Total.
Pennsylvania..	553,780	301,988	...	855,768
Other states..	1,252 841	953,973	...	2,206,814
Total for 1909.	1,806,621	1,255,961	...	3,062,582
Total for 1908.	1,354,236	567,304	71	1,921,611
Total for 1907.	3,380,025	252,704	925	3,633,654

Of the total production of rails in 1909 2,884,133 tons were rolled from ingots made by the makers and 178,449 tons were rolled from purchased ingots or blooms, crop ends, "seconds," or renewed or rerolled rails.

Bessemer Steel Rails.—The production of Bessemer steel rails in 1909 amounted to 1,806,621 tons, against 1,354,236 tons in 1908, an increase of 452,385 tons, or over 33.4 per cent. Of the total in 1909 1,723,964 tons were rolled by makers of domestic ingots and 82,657 tons by companies which did not operate Bessemer converters. Included in the total by makers of domestic ingots are about 62,000 tons of re-rolled rails. The following table gives the production by states from 1906 to 1909:

Bessemer rails.	1906.	1907.	1908.	1909.
Pennsylvania..	1,298,409	1,093,932	315,563	553,780
Other states.	2,493 050	2,286,093	1,038,673	1,252,841
Total.	3,791,459	3,380,025	1,354,236	1,806,621

Open Hearth Steel Rails.—The production of open-hearth steel rails in 1909 was 1,255,961 tons, against 567,304 tons in 1908. The increase in 1909 over 1908 was 688,657 tons, or more than 121 per cent, while the increase in 1908 over 1907 was 314,600 tons, or over 124 per cent. Almost all the open-hearth rails in 1909 were rolled from basic steel, and virtually all were rolled by producers of open-hearth ingots. The maximum production was reached in 1909. Indiana was the largest maker of open-hearth rails in 1909, followed by Pennsylvania, Colorado, Alabama, Ohio, New York, Illinois, Maryland and New Jersey in the order named. In previous years Alabama had always been the leading producer.

Iron Rails.—Iron rails were not rolled in 1909. In 1908 the production was 71 tons.

Weight of All Kinds of Rails.—The following table gives the production of all kinds of rails in 1909 according to the weight of the rails per yard. Street and trolley rails are included.

The production of rails weighing under 45 pounds to the yard shows an increase of 71,989 tons in 1909 as compared with 1908, rails weighing 45 pounds and less than 85 pounds an increase of 352,986 tons, and rails weighing 85 pounds and over an increase of 715,996 tons.

Kinds of rails Gr. tons.	45 pounds Under 45 pounds.	and less than 85.	85 pounds and over.	Total. Gr. tons.
Bessemer rails	...223,568	735,500	847,553	1,806,621
Open-hearth rails	... 32,290	305,684	917,987	1,255,961
Total, 1909	255,858	1,041,184	1,765,540	3,062,582
Total, 1908	183,869	688,198	1,049,544	1,921,611
Total, 1907	295,838	7,569,985	1,767,831	3,633,654

Alloyed Rails.—Included in the 3,062,582 tons of steel rails rolled in 1909 are 50,505 tons of alloyed steel rails, as follows: Titanium rails, 35,945 tons; manganese rails, 1,028 tons; nickel-chrome rails, 12,287 tons; and nickel steel and electric steel rails, 1,245 tons. The 50,505 tons of alloyed steel rails produced in 1909 were rolled by eight works in six states. Of the total 36,809 tons were rolled from alloyed Bessemer steel and 13,696 tons from alloyed open-hearth steel. The above are the first alloyed rail statistics that we have gathered.

The Canton Boiler & Engineering Co., of Canton, O., has just received an order for ten 60-ton capacity steel ladles from the Cambria Steel Co., of Johnstown, Pa. This makes 17 60-ton ladles which this company received orders for this year, with several 40-ton and 30-ton ladles. The Canton Boiler & Engineering Co. is practically a specialist in this line of work.

BAUSCH COMPANY

Acquired by Confectioners' Machinery & Mfg. Co.—Busy Pope Company.

Boston, Mar. 1.

The National Equipment Co., controlling the stock of the Confectioners' Machinery Co., has acquired the entire capital stock of the Baush Machine Tool Co., at Brightwood, Mass., in order to provide additional plant facilities for its business. The Baush company is a maker of multiple spindle drills, radial drills, vertical boring and turning mills and special machinery and is capitalized at $150,000. The company has a modern, up-to-date plant wth an especially well-equipped foundry. It was organized at Holyoke, Mass., about 20 years ago, and has enjoyed a substantial development. Clarence J. Wetsel will remain as treasurer and general manager of the Baush company. Frank E. Bocorselski, who has been superintendent of the Baush company, will be superintendent of the engineering department and W. F. Wadleigh assistant superintendent of the Confectioners' company, will be general superintendent of the Baush company. Eventually the Confectioners' company will erect important extensions.

The Pope Mfg. Co., of Hartford, Conn., is now buying material for its 1911 business, as all the business for the current year has been provided for and placed. It is reported that the company on Feb. 1 had earned a surplus of $350,000, a sum equal to 6 per cent on both the preferred and common stocks. It has been decided to place the common stock on a 6 per cent basis per annum for this year. Therefore the profits for the six months to come in the fiscal year, which ends July 31, will be available for the surplus.

John Kirby, Jr., of Dayton, Ohio, president of the National Association of Manufacturers, addressing the Worcester (Mass.) Builders' Exchange at the twenty-fourth annual meeting last Wednesday night, denounced the American Federation of Labor in words that were not in the slightest degree to be mistaken as to their meaning. Messrs. Gompers and Mitchell, he termed "men of traitorous intent." While he was not opposed to the lawful organization of workingmen for their own good, he said he believed the Federation had overstepped the limit in its fight against the United States Steel Corporation. "The past epidemic of 'Gomperism,'" he said, "has nowhere the hold on the American manufacturers and workingmen it had 10 years ago."

The Boston & Maine railroad has ordered 500 freight cars from the Laconia Car Works.

The Esmond Mills of Esmond, R. I, has been granted a charter of incorporation under the Massachusetts laws and has increased its capital stock by the issue of $100,000 common and $650,000 preferred. The new stock issue is for the purpose of retiring bonds, providing more working capital and for adding more machinery.

The reception to Rear Admiral Francis T. Bowles, president of the Fore River Shipbuilding Co., Quincy, Mass., extended by the citizens of the city in recognition of the admiral's return from Europe with the contracts for two 28,000-ton battleships for the Argentine Republic, was unavoidably postponed from Feb. 23 to Tuesday, March 1. The admiral said that the work to be done under the contracts will call for the addition of 1,000 skilled workmen, and, later on, the addition of 3,000 to 4,000 to the population of Quincy. There will be paid to Quincy alone on account of the contracts at least $2,000,000.

CORPORATION CUTS DOWN USE OF LOW PHOSPHORUS PIG.

One of the effects which has resulted from the experimental use of the Heroult electric furnace at the Worcester, Mass., plant of the American Steel & Wire Co. has been the reducing of the amount of low phosphorus pig iron consumed at this works. It is estimated that already the use of this grade has been cut down one-half, and if the electric furnace is found to be fully successful from a commercial standpoint, it is very likely that the tonnage of low phosphorus consumed at Worcester will be insignificant or practically nothing. There have been no purchases of low phosphorus iron by the United States Steel Corporation lately.

COAL AND COKE SHIPMENTS.

The Pennsylvania Railroad Co.'s statement of coal and coke shipments on the system lines east of Pittsburg and Erie, for the month of January, 1910, shows that the company handled a total of 6,083,160 tons, an increase of 1,201,221 tons, divided as follows: Anthracite coal, 1,045,274 tons, an increase of 37,384 tons; bituminous coal, 3,624,729, a gain of 614,033 tons: coke, 1,413,157 tons, an increase of 549,804 tons.

FIRST WORK

On Auxiliary Fire Protection System for San Francisco.

The first work on the auxiliary fire protection system for San Francisco, which will require many miles of iron pipe and many thousands of tons of iron and steel in the construction and in fittings, has been begun. The first work done in that direction is now in progress on the 10,000,000 gallon reservoir site on the flank of Twin Peaks in the construction of the tunnels leading from this central factor of the auxiliary system.

Two 20-inch mains will lead to the lower levels from the big basin near the summit of the mountain, conveying its pressure to the system of pipes gridironing the city. Ordinarily it will be used in drawing off the supplies for the 500,000-gallon reservoir, which will supply the constant head of the system. With the completion of the tunnels a larger force will be employed and work on the big reservoir itself will begin. The latter will be built in two parts, with a division wall, so that any possible accident to any portion of the concrete wall will not drain the entire reserve of water.

The contracts for the construction of the first of the two pumping stations have been let and work has already commenced, and the contract for the other station has been let to the Healy-Tibbitts Construction Co., at $138,300.

Over 30,000 tons of the cast iron pipe to be laid in the streets have been received, and the laying of the 90 miles of conduits will begin within the next few weeks.

LAWRENCE IRON CO. ELECTS OFFICERS.

Ironton, O., Mar. 1.

The stockholders of the Lawrence Iron Co., successors to the Bird Iron Co., have organized as follows: President, Col. H. A. Marting; vice president, D. C. Davies; secretary and treasurer, H. R. Browne; superintendent, J. H. Ferguson. The directors are D. C. Davies, Col. H. A. Marting, Hugh Russell and A. H. Mittendorf, of Ironton; John E. Williams, of Portsmouth; E. McFarland and Jas. A. Green, both of the firm of Matthew Addy & Co., Cincinnati. Announcement is made that the furnace will be put in blast within 60 days on basic iron. Practically all the capital stock of $250,000 has been subscribed.

THE INFLUENCE OF MANGANESE SULPHIDE ON IRON AND STEEL*

Results of Scientific Investigation of a Somewhat Obscure and Little Known Subject.

By Donald M. Levy, A. R. S. M.

Manganese sulphide is one of those constituents of iron and steel which, though perhaps of subordinate importance so far as its direct influence on the character of the material is concerned, is still by no means a negligible factor; and since its quantity, condition, and distribution are matters with which those engaged in practice in iron and steel industries have nowadays to reckon in no small degree, a paper devoted to the discussion of its condition and the rationale of its separation may be opportune.

In examining from a scientific point of view the behavior of iron and steel, no matter what particular branch of the subject engages attention, acknowledgement has almost always to be made to the valuable practical results and to the profound insight of workers whose names are well known to this institute, more particularly those of J. E. Stead, Professor Arnold and Professor Le Chatelier. Their work on the subject of this paper is doubtless familiar. A number of other investigators have recorded highly interesting observations to which reference will be made in due course; whilst the author submits certain observations of his own, made during a series of researches on the condition of sulphur in iron and steel, which work, though still in progress, has yielded some results which may assist in throwing light on points previously obscure and anomalous. A special obect of the paper is to connect these observed facts regarding manganese sulphide with those general scientific principles which have become so useful in assisting those engaged in iron and steel industries to understand more clearly what is happening to the metal under the varying conditions of works practice. This paper is contributed in the hope that members, many of whom have frequent opportunities of observing the behavior or peculiarities of manganese sulphide in practical working, will, by recounting their experience, still further assist in this co-relation of scientific theory wth actual practice, which is the special function of papers of this kind to call forth, and of institutes such as this to foster.

It would be gratifying to be able to commence with a concise account of the chemical and physical properties of manganese sulphide, but unfortunately this is a substance of which, in its pure state, very little is known; it is indeed difficult to obtain such material. Specimens are submitted here of three samples of manganese sulphide, each guaranteed as the purest obtainable from the best known makers of chemicals. One of the samples is reddish green, another light gray, and the third black in color.

The preparation and investigation of a pure manganese sulphide is a matter of importance in a further study of the subject. Meanwhile it may be interesting to collect what evidence we already possess regarding the properties of manganese sulphide as seen in practice.

Early Opinions in Error.

The general view taken as to the occurrence of manganese sulphide in iron and steel was that in the presence of manganese, the sulphur separates in the form of MnS, as the first constituent to solidify. By its insolubility and infusibility, combined with its low specific gravity, it would, if given time, rise to the surface of the metal out of harm's way, or under more rapid cooling remain entangled in the mass of the metal in the form of comparatively harmless grains, having an effect more or less equivalent to that of small grains of sand throughout the material. In support of this view Le Chatelier and Ziegler (1) found that the manganese sulphide has a higher melting point than metallic manganese. The melting point of manganese was at that time thought to be above that of iron, from which Le Chatelier and Ziegler deduced that manganese sulphide also was more infusible than iron, and explained the favorable behavior of manganese on sulphury irons as being due to this property. The melting point of manganese is now taken as 1,247 degrees Cent., and the author thinks that had the actual melting point of manganese been known at the time, and how much it was below that of iron, Le Chatelier would have somewhat modified his view given above. His excellent photographs and observations deserve study. Arnold and Waterhouse (2) stated that sulphide of manganese is much less fusible (than iron sulphide), segregates whilst the iron is at a high temperature, and so collects into rough globules and very seldom into meshes. At the same time many workers have made observations regarding the behavior of manganese sulphide in steels which indicate that the normally infusible crystalline sulphide exhibits to a marked extent the properties of plasticity, viscosity, and a more or less pronounced fusibility. These effects are well reflected in a paper by Henry Fay (3), in which he remarks as follows at a meeting of the American Society for Testing Materials:

"Manganese sulphide is dangerous in steels. A number of rail fractures have been examined, and this compound found to be the cause of a great deal of the trouble formerly laid to gas and rolling flaws. Metal containing much manganese sulphide to which manganese has been added should not be rolled at high temperatures on account of the squeezing out of this compound into dangerous plates and threads. The melting point of the manganese sulphide was determined as 1,162 degrees Cent., and it showed considerable plasticity below this temperature. Specifications should limit more generally the amount of sulphur permissible in steel and the metal should be allowed to stand after the manganese additions to allow the manganese sulphide to float to the top."

We have here 1,162 degrees Cent. definitely given as the melting point of manganese sulphide—described as a green material of specific gravity 3.966; plastic for a considerable range below its melting point.

Law (4), again, has found no difficulty in melting manganese sulphide in the ordinary coke-fired assay fur-

*Paper read before the Staffordshire Iron and Steel Institute, February, 1910.

nace, which was quite incapable of melting mild steel. The product is described as highly vitreous, of conchoidal fracture, and of a deep brown color viewed by transmitted light. Unfortunately these workers give no analyses of their products, so that opinion as to their results must be reserved, especially in view of the appearance recorded of the melted product. The divergence in results will be understood, and by those familiar with the methods of determining high melting points the experimental difficulties of ascertaining such temperatures for a substance so readily oxidized, so chemically active on the walls of the containing vessel, and of such slight fusibility, will be appreciated. The author, after repeated trials, has not been able to confirm the low melting point of manganese sulphide. The material has been heated to the highest temperatures of an injector furnace without doing much more than fritting. A retreatment has resulted in fusion in a number of cases, the melt, however, being found to contain silica. This melted material showed, nevertheless, the expected crystalline brittle characteristics of sulphides or mattes. The author's work would suggest a temperature somewhat below 1,505 degrees Cent. (the melting point of iron) as the melting point of manganese sulphide—about 1,400 degrees is suggestive tentatively until a more definite figure can be communicated.

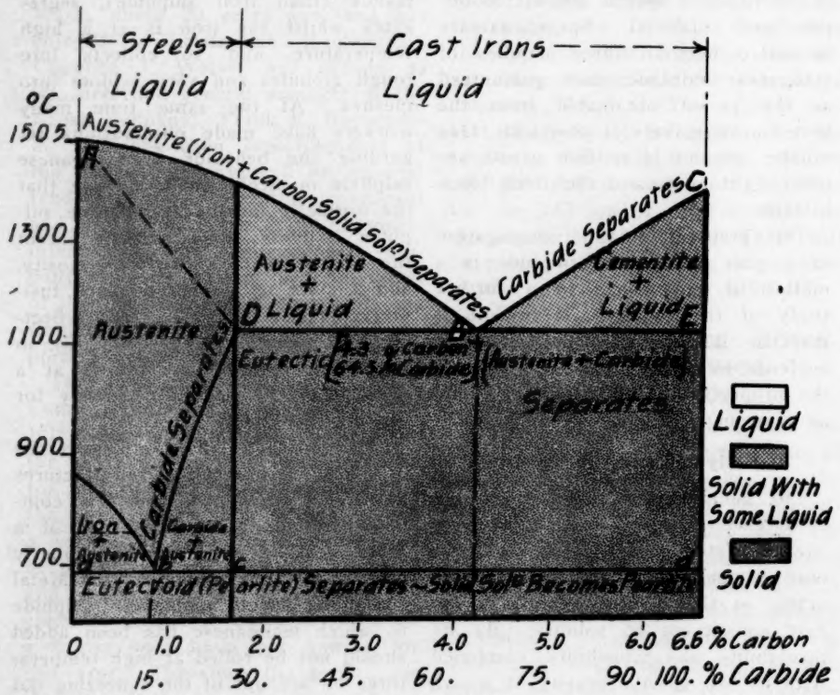

FIG. 1—CONSTITUTIONAL DIAGRAM OF CAST IRONS AND STEEL.

There are three important factors which, among others, determine the condition and distribution of the manganese sulphide. These are:—

(1) Its melting point.

(2) Its solubility and the proportion present.

(3) The composition of the cast irons and steels of which it was a constituent.

These factors in reality act in conjunction, and the resultant effects may be summarized as being somewhat analogous to those already elucidated for the case of iron-sulphide. In this connection it was shown by the author in his Carnegie Research (5) that iron-sulphide occurred in a totally different condition and separated in a different manner and at different temperatures, according to the composition of the metal and the proportion of sulphide present. It was pointed out that iron-sulphide itself melts at upwards of 1,180 degrees Cent. In steels this sulphide is associated with an excess of iron, forming a eutectic which melts at 970 degrees Cent. In cast irons (free from silicon and manganese) the sulphide occurs in the cementite areas, being associated with the cementite-austenite eutectic forming a triple eutectic which solidifies at about 1,130 degrees Cent. It was further shown that when the sulphide is present in quantities above the solubility limit this sulphide is, in cast irons, the first constituent to solidify, and is found also in the pearlite. Now in the case of manganese sulphide somewhat similar considerations hold, and the manganese sulphide is found in different forms and in different positions in cast irons and in steels with different compositions, depending also on the proportion of sulphide present.

Before discussing the solidification sequence of the irons and steels of various composition, and in dealing with the first of the factors mentioned above, it is advisable, as a preliminary, to examine whether the manganese sulphide under consideration is in reality pure or not. Taking as a first instance the case of mild steels containing sulphur where manganese is also present, we have here conditions such as might be represented by an equation

$$Fe\,S + Mn \quad MnS + Fe.$$

It has, however, been indicated experimentally (6) that if manganese and iron sulphide be heated together at 1,500 degrees Cent. in proportions such as are represented above, instead of the resulting products being wholly iron and MnS. as expected, there were obtained a button of iron containing manganese (5 per cent in the case given) and a layer of manganese sulphide containing some iron (11.5 per cent Fe. in this case). Even commencing with manganese sulphide and iron and melting together, they did not remain unchanged, as might have been anticipated, but the iron took up 10 per cent of manganese and the manganese sulphide absorbed 4 per cent of iron. The reaction $Fe\,S + Mn \lessgtr Mn\,S + Fe$ would hence appear to be of the nature well known scientifically as a mass reaction, though a conclusive statement can only be based on an extended and confirmatory series of experiments. It is not, however, incorrect to deduce that the presence of manganese in excess of that required by the formula MnS. is necessary to insure the sulphur being all converted to manganese sulphide. Now in the case of mild steels we know that there is excess of iron since there is not sufficient carbon to combine with the whole of the iron;—in the cold solid metal, in addition to the pearlite, which contains the combined carbon, there is much free iron (ferrite);—so that in such cases particularly, there exists a condition tending to favor the reversal of the reaction indicated above; unless manganese is present in correct excess.

Variation in the character of the manganese sulphide is frequently to be noticed in examining steels under

the microscope by differences in its color. It is usually, as Arnold first showed, of a dove-gray tint. But it has been recorded (3) that the color of the manganese sulphide varies with the proportion of manganese and the possibility that manganese is soluble to some extent in the sulphide has been deduced from this. It has further been noted (4) that the sulphide in steels varies from an extremely pale color to a very dark one, possibly due to the presence of iron.

It may be therefore laid down that the manganese sulphide, at least in mild or low carbon steels, is probably not pure, but contains varying amounts of iron or of additional manganese. It follows as a natural deduction that this presence of impurity lowers the melting point of the sulphide, with the consequent results of increased plasticity, etc., met with in practice.

At the same time as the melting point, the solubility of manganese sulphide is a point worthy of consideration. All observations tend to indicate the solubility of manganese sulphide in the liquid irons and steels—even if only to a very limited degree. Though the presence of manganese sulphide in the solid steels and cast iron may be largely due to mechanical causes—a point which deserves further investigation—there is evidence of the possibility of absorption of manganese sulphide by the liquid metals.

Manganese Sulphide in Steel.

The foregoing considerations give us help in understanding and following the action of the manganese and the sulphur in steels. There is formed in the liquid metal manganese sulphide, more or less pure, depending on the proportions of the different elements present.

Owing to a limited solubility (doubtless varying with the temperature of the molten material) the bulk of the sulphide in high MnS. steels tends to separate and to rise to the surface of the metal; but some is retained. This retained manganese sulphide remains liquid whilst the steel is solidifying, and we have the manganese sulphide particles in small grains, globules, broken meshes, etc., solidifying at the boundaries of and between the primary steel crystals. Microscopic observations readily support such an explanation, and of the published photographs Arnold's classical Fig. *G* (2) illustrates the concordance very well. Mr. Stead's first paper (3) also contains an excellent example (Fig. 18). He, too, already stated on that occasion "that there is no evidence that the sulphide of manganese crystallizes in advance of the steel itself, differing in this respect from what evidently occurs in cast iron."

Since this sulphide has certainly a much higher melting point than the iron sulphide eutectic (970 degrees Cent.) found in steels too low in manganese, it does not remain fluid sufficiently long to form the complete mesh-work so familiar in the latter class, except under exceptional circumstances.

In order to indicate the position and distribution of the manganese sulphide in the cold solid steels, it is

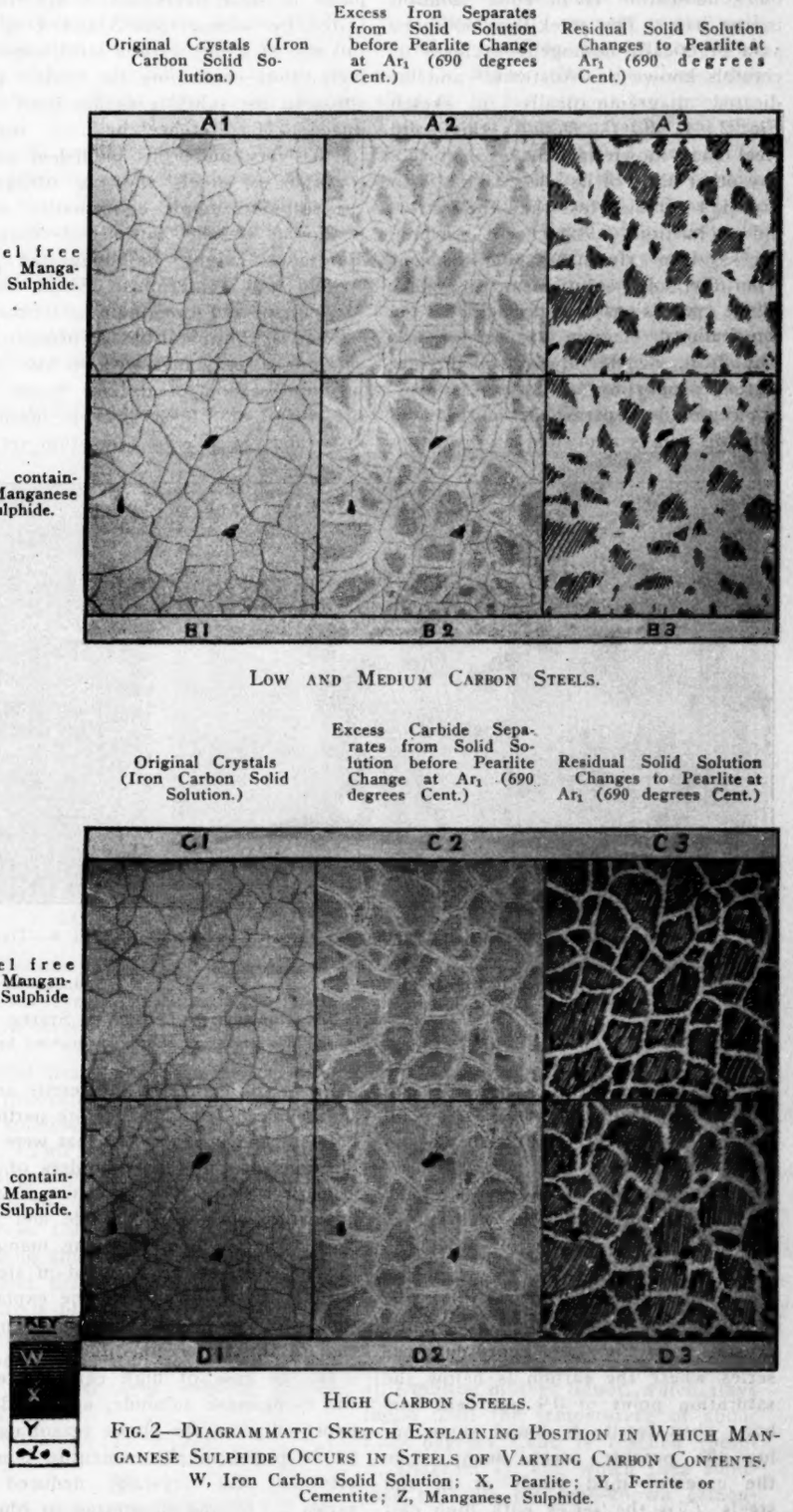

Fig. 2—Diagrammatic Sketch Explaining Position in Which Manganese Sulphide Occurs in Steels of Varying Carbon Contents. W, Iron Carbon Solid Solution; X, Pearlite; Y, Ferrite or Cementite; Z, Manganese Sulphide.

necessary to recall at this point the solidification sequence of the iron-carbon alloys. It is now universally recognized that the carbon in steels on solidification is in solid solution in the iron. The steel thus solidifies as a practically homogeneous mass of crystals known as "Austenite" and indicated diagrammatically in sketch Fig. 2, A_1, B_1, C_1, D_1. As this solid steel cools down it behaves just like any other alloy of its class. That is to say, if it contains less than the eutectoid proportion (0.9 per cent) carbon, excess iron (ferrite) separates out from the solid solution at the edges of the crystals; as is indicated from the constitutional diagram ab, bc, ed and Fig. 2 A_2, B_2. If more than the eutectoid proportion of carbon is present cementite separates from the solid solution and is deposited at the edges of the crystals in C_2. This goes on until the residual crystals of solid solution reach the saturation or eutectoid proportion (0.9 per cent carbon) when at Ar_1 (690 degrees Cent.) they change *in situ* to the well-known pearlite. Series sketches *A* and *B* Fig. 2 illustrate this.

The pearlite thus marks out the position of the original Austenite crystals. In Fig. 2, *A* represents the series where the carbon is below the saturation point of 0.9 per cent carbon, when ferrite is found surrounding the pearlite areas, such as in the case of mild steels or in rail steels; *C* is the series with high carbon contents—corresponding to the part *bc*, *bd* of diagram 1—containing carbon above the eutectic proportion, where carbide (cementite) separates at the crystal edges from the solution until 0.9 per cent carbon is reached, when at Ar_1 the pearlite change again occurs.

Series *B* and *D* illustrate the position taken up by the manganese sulphide in such steels, which are illustrated by micrographs 3 and 4, of a rail and of a high carbon steel respectively; thus confirming the typical position of the sulphide as has been deduced. If reference be now made to the very numerous published photographs of steels showing manganese sulphide, ample confirmation will be found of the author's deduction. Reference might be suggested to Arnold and Waterhouse, Stead, Fay, McWilliam and Longmuir, and others.

That is, the quantities of manganese sulphide usually met with in low and medium carbon steels are found in the form of blobs, broken meshes, dots, and the like in a position seemingly at the center of the ferrite areas and removed from the pearlite portions. It is situated in reality at what were the junctions of the ferrite borders of the primary crystals. The association of other impurities, such as phosphide and silicates, for example, with the manganese sulphide, so often noted in steels, necessarily follows from the explanation given of what decides the position of this latter constituent.

In the case of high carbon steels, the manganese sulphide, as would be expected from the above reasoning, is to be found in the cementite boundaries of the crystals; deduced in series *C*, *D*, and illustrated in photograph 4, and the greatly increased danger from manganese sulphide in the already brittle borders of such high carbon steels is apparent.

In steels of about eutectic composition the manganese sulphide blobs are at the boundaries of the pearlite areas which comprise almost the whole mass of the material.

From this will now be understood the ease with which the sulphide is rolled out into strips occurring usually in the carbonless areas in mild and rail steels; and the danger which might possibly arise from the presence of unduly large quantities of the sulphide; for not only have we a brittle material present destroying homogeneity and consequent ductility, but it just occurs in the worst possible position, not so much in the center of a continuous ductile area, as at what were crystal junctions, which it tends to retain as such.

It has just been shown that manganese sulphide in steels solidifies after the steel itself has crystallized out and is seen to occur in the globular, blobby or similar forms one would expect from separation under such conditions, of a material with its melting point—though still high—lowered by the fact of its not being quite pure.

This is somewhat analogous to the conditions under which the dangerous sulphide of iron separates in steels. It may be well to recapitulate why the behavior of the materials is so different. First, the melting point of the impure (eutectic) iron sulphide is so low (970 degrees Cent.) that this constituent is fluid at rolling heats and such liquid envelopes may often almost completely surround the steel crystals. Manganese sulphide, being no more than plastic, and only existing as blobs or broken meshes, is obviously not so dangerous, though it is equally obvious that excessive quantities at high rolling tempera-

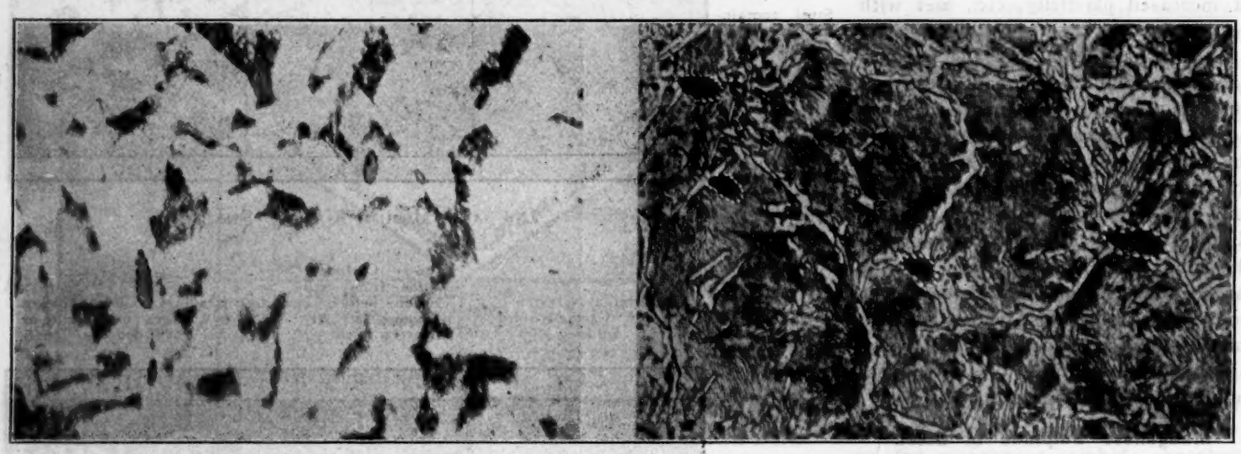

FIG. 3—RAIL STEEL —— x 300 DIAMETERS.
Manganese sulphide in low and medium carbon steels. (Situated in Ferrite areas.)

FIG. 4—TOOL STEEL (1.4 PER CENT CARBON) —— x 700 DIAMETERS.
Manganese sulphide in high carbon steels. (Situated in Cementite borders.)

MANGANESE SULPHIDE IN STEELS.
(Manganese sulphide areas are shown surrounded by dotted lines.)

tures is a material which must be regarded with caution.

A second cause of the dangerous character of iron sulphide in steels is possibly connected with an allotropic change which occurs at about 150 degrees Cent. in the iron sulphide. This transformation was studied by Le Chatelier and Ziegler, and was found to be accompanied by a very marked dilatation. Such change of volume will doubtless have a considerable effect in breaking up the sulphide boundaries of the steel crystals throughout the metal and thus tend to account for Arnold's well-known observation that whilst innumerable cracks occur through the mass of the steel containing iron sulphide, the sulphide of manganese is held very tightly in the mass of the iron by contraction, and it seldom falls out during polishing.

It would seem that a somewhat similar state of things occurs in the case of manganese sulphide in cast iron, and that we have two forms of sulphide, two types of position, and two periods of sulphide separation depending upon the proportions present.

Manganese sulphide appears to be soluble in liquid cast irons to a limited extent. Hailstone's observations (8), suggest a definite value for this solubility. He has stated repeatedly that "when the sulphur in a piece of cast iron was under 0.11 per cent the manganese sulphide was always found in the cementite," but when more than this amount of sulphur is present in the casting, then he always finds some present in the pearlite as well.

To realize the importance and the practical bearing of this observation, it is necessary to consider once again the solidification sequence of cast irons. This has been fully described and illustrated already in a contribution to the discussion on Mr. Stead's paper in October, 1908 (9).

Taking the instance given above, it is found that when 0.13 per cent of sulphur is present in the casting manganese, sulphide is always found in the pearlite as well as in the cementite. 0.13 per cent sulphur corresponds to

$$\frac{0.13 \times (55 + 32)}{32} = 0.42$$

per cent manganese sulphide; 0.11 per cent sulphur (the saturation limit), corresponds to

$$\frac{0.11 \times (55 + 32)}{32} = 0.30$$

per cent manganese sulphide.

Consider such a cast iron in the liquid state, and proceed to follow its sequence of solidification (see Diagram 1).

As the metal cools down, the excess of manganese sulphide separates out first, occasionally as well as the well-known crystallites, for its solidifying point is higher than the iron-carbon alloy of ¾ per cent carbon contents. The amount thus separating out first is 0.42-0.30 or about 0.12 per cent of manganese sulphide; the rest remains in the still liquid metal. Round the primary MnS. areas the Austenite crystals commence to grow as the cast iron begins to solidify (point *A* Diagram 1), and as these change first to martensite and then to pearlite at Ar_1, we find this manganese sulphide as primary areas in the pearlite portions of the cast irons (see Fig. 5).

FIG. 5—STAFFORDSHIRE COLD BLAST IRON —— x 300 DIAMETERS.
Manganese sulphide situated in pearlite area. Crystallite; also patches.

FIG. 6—DISTINGTON MOTTLED IRON —— x 300 DIAMETERS.
Manganese sulphide situated in cementite areas, as well as in pearlite.

MANGANESE SULPHIDE IN CAST IRONS.
(Manganese sulphide areas are shown surrounded by dotted lines.)

Manganese Sulphide in Cast Iron.

The analogy between the distribution of manganese sulphide and iron sulphide just noted in steels extends also to cast iron, allowing, of course, for the individual differences in properties between the two substances.

In connection with the case of iron sulphide, it was shown that there is a certain definite solubility for this substance in cast iron; if excess be present, this excess sulphide itself is the first constituent to solidify, and it is found in a definite position and in a definite form corresponding to such position. Further, it was shown that the sulphide remaining in solution in the cast iron, separated with the cementite eutectic at about 1,130 degrees Cent., and this appeared as a constituent of a triple eutectic.

If 0.11 per cent S. (0.30 MnS.) be taken as the solubility limit for manganese sulphide in liquid cast iron, it is obvious that if less than this amount be present there will be no excess MnS. undissolved to crystallize out first; the pearlite will then be free from manganese sulphide, which will all be found in the cementite areas.

The manganese sulphide still dissolved in the cast iron (0.30 per cent = (0.11 per cent. S) remains in the still molten mother liquor, which stays liquid until the temperature of about 1,130 degrees Cent. is reached (point *B*, Diagram 1), and which then solidifies to form the well-known cementite-Austenite (pearlite) eutectic; and it is in these areas (Fig. 6) that this manganese sulphide is found. Its distribution, therefore, is somewhat analogous to that of the iron sulphide under similar circumstances, though its form differs somewhat consequent on

its greater infusibility and lower liquidity. It is to be noted that it tends also towards the junctions of the pearlite and cementite.

It may be remarked that as the proportion of manganese to sulphur in the cast irons become less the sulphide constituent—apart from its color—behaves more and more like the iron sulphide itself, both as regards position and form.

In such cases this sulphide has a compound structure to which the author has already drawn attention. In the contribution to the discussion on Mr. Stead's paper, he showed a colored micro-photograph (reproduced in black and white in Fig. 7) of a Staffordshire cold blast phosphoric iron which contained a compound crystal area of manganese sulphide and iron sulphide, of which there were many scattered throughout the mass of the metal. The analysis of the metal in the immediate neighborhood of these areas was taken, and showed 0.39 per cent sulphur and 0.58 per cent manganese—not quite sufficient for the complete formation of the compound MnS.

The author stated at the time that such double sulphides behave much like the iron sulphide itself, particularly as regards viscosity, fusibility, and surface tension; the more so, the lower the manganese proportion, and it was further remarked that it is possible for some iron sulphide to be thus associated with the manganese sulphide unless a distinct excess of manganese be present beyond that required by the formula MnS.

Behavior of Double Sulphides Uncertain.

How far this may be caused by the mass action referred to in the case of steels cannot yet be stated. The conditions with regard to the amount of free iron present are different, since in cast irons the iron is practically saturated with carbon existing as carbide, leaving little free iron to disturb the equilibrium. Further reasons which suggest themselves are the probable solubility of the FeS in MnS, and also what may be designated as selective combination by manganese; some aspects of the latter are dealt with in the concluding portion of this paper.

One peculiarity of these double sulphides will be observed from the photograph, the two sulphides not occurring as interlaying striae, but as a rule the manganese sulphide appears in the form of an idiomorphic crystal of the familiar dove-gray color embedded in a globular mass and yellow-brown iron sulphide.

The author has observed this compound structure time after time in a number of white and mottled irons of different brands when examined closely. Le Chatelier and Ziegler have published two photographs illustrating this compound structure obtained in laboratory experiments.

Recently a mottled Distington (?) iron (S 0.25 per cent Mn. 0.14 per cent and silicon 0.84 per cent) has been examined, regarding the white portions of which the following notes

Manganese sulphide and iron sulphide often in separate blobs are evenly distributed in the cementite and the pearlite areas. Many patches in both are of the double sulphide. Except for the color, the MnS. and the FeS. are almost indistinguishable, though

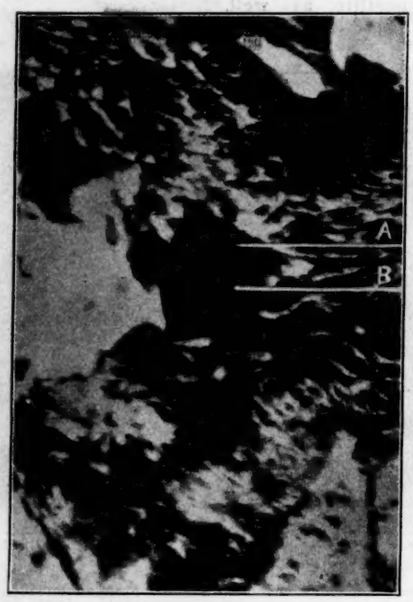

FIG. 7—COMPOUND MnS AND FeS STRUCTURE SHOWN IN STAFFORDSHIRE COLD BLAST PHOSPHORIC IRON ——— x 1,000 DIAMETERS.
A. Iron sulphide, yellow brown; B, Manganese sulphide, dove gray.

the FeS. tends to greater roundness. There is little difference in the form of the sulphide blobs, whether in the pearlite or the cementite. Double sulphide constituent acts like iron sulphide itself in forming the links which join up the pearlite in the cementite-pearlite eutectic areas.

The latter observation has also been made on a high-class hematite white iron.

Manganese Sulphide and Silicates in Cast Iron and Steel.

The relationship between manganese sulphide and silicates involves questions of great practical importance in iron and steel work.

It will doubtless occur to members to ask how is it possible to remove the sulphur as manganese sulphide in mixer-metal to such low figures as 0.03 or 0.04 per cent S., if manganese sulphide is soluble in liquid cast irons to the extent of about 0.30 per cent (0.11 per cent S). In the author's opinion it appears to be largely on account of the greater solubility of manganese sulphides in silicates of manganese and iron. In mixer practice, for example, though the manganese sulphide above the solubility limit may rise to the surface of itself; the sulphide below the 0.30 per cent = (0.11 per cent S.) limit suggested does not rise on its own account so much as being dissolved out and carried up in the silicates present.

Illustrations of this in practical working will doubtless be familiar.

As an instance, at the Hoerde Works (10), where the mixer was first introduced, the blast furnace charges poured in contained sulphur to extents of 1.02, 1.53, 0.68, 0.50 per cent, etc. (average of the fifteen 10-ton charges being 0.64 per cent S.). The average of the fifteen 10-ton charges withdrawn was 0.05 per cent. S. (maximum 0.056 per cent, minimum 0.034 per cent S.). In other cases a reduction of more than 50 per cent of the sulphur in the pig is very common practice by the use of the metal mixer.

An analysis of an actual sample of the slag gave:—

	Per Cent.
MnS	28.01
MnO.	20.23
FeO.	25.46
SiO_2	18.90
Al_2O_3	5.00
CaO.	3.53
MgO.	0.43

which indicates that much manganese is present as silicate and that the sulphur eliminated is in the form of manganese sulphide, much of which most probably dissolved and was carried up by the silicates of iron and manganese present.

The association of the sulphide with silicates has been long known. Arnold's paper on "Steel Castings" will be remembered as announcing the presence of a sulpho-silicide of iron, whilst the admirable subsequent microscopic work by Stead (12) clearly showed the association of manganese sulphides with silicates, well illustrated by his micro-photographs.

Reference should be made to his photographs of a patch of silicate of manganese containing globules of manganese sulphide. "The examination of a large number of laminated broken tensile test pieces of a steel

has proved that the lamination is caused frequently by the presence of green silicate of manganese, almost always accompanied with a little sulphide." Mr. Stead further threw out very valuable suggestions on the subject in giving the first of his papers here, especially on the removal of sulphur in puddling practice, to which also the above reasoning applies.

Law, again, publishes a photograph of a compound patch of manganese sulphide and silicate, which he notes occurs frequently.

The far reaching importance, therefore, of the view advocated of the importance of silicates in the removal of sulphur is evident, and it has application over a very wide field.

Referring again to mixer practice, it is well known that desiliconization (intentional or otherwise) is not infrequently a marked feature of this treatment (13), in addition to the removal of sulphur as manganese sulphide. The silicon which is thus removed from the metal is, of course, oxidized and passes into the slag as silicates, probably consuming manganese as oxide and also iron oxide for this purpose, and from the evidence we already possess regarding the solubility of the sulphide in silicates the efficiency of the mixer as an agent for removing sulphur with the aid of manganese may be largely due to this effect.

Value of Silicates.

An interesting series of experiments do indeed suggest themselves as to how far silicates and oxides to form silicates (even intentionally added) are of use in assisting the removal of manganese sulphide in irons and steels, when this is present in dangerous amount.

It will be seen now how it is possible, as pointed out elsewhere, for a cast iron to contain compound FeS-MnS areas even when analysis indicates that there is theoretically sufficient manganese present to satisfy all the sulphur. If a bath of fluid metal contain oxygen, oxides, or silicates, as well as sulphur, and if manganese be present, it is very probable, bearing in mind the avidity with which manganese "scours out" oxygen, that some manganese oxide and silicate is formed even in preference to manganese sulphide. In the above case, therefore, if some of the manganese be present in the form of silicate, its equivalent of sulphur will be left free to combine with iron.

In conclusion, consideration of the above evidence will render it obvious that in giving analysis of irons and steels—particularly those intended for special purposes—it is not sufficient merely to return results as manganese contents, silicon contents, sulphur contents, and so forth. For a proper knowledge of the metal it is also necessary to know how these various elements, etc., are combined with one another. This knowledge, as has been shown, cannot be assumed from the assay values alone; the analysis should be supplemented by microscopic examination, which renders remarkably clear evidence not only as to what compounds, if any, may be present, but also as to the form, position, and distribution of such compounds, and in what way they are likely to act as deleterious or dangerous constituents; and perhaps even offering clues as to methods for their removal or for counteracting their ill-effects.

Summary.

Pure manganese sulphide has a melting point somewhat lower than pure iron; about 1,400 degrees Cent. is suggested tentatively.

In steels the manganese sulphide is not always pure, but often contains varying quantities of iron or manganese according to the composition of the steel. Such manganese sulphide has naturally a markedly lower melting point than the pure substance. The variation in color of such impure manganese sulphides can be observed microscopically.

Though the bulk of the manganese sulphide tends to separate from steels, some is retained in the liquid metal, and solidifies after the steel has become solid. It separates at the boundaries of and between the primary crystals, and is hence found in the ferrite areas in low carbon steels and in the cementite borders of high carbon steels, removed from the pearlite areas. It occurs in the form of blobs, globules, broken meshes, etc.

In cast irons the distribution, form and temperature of separation of the sulphide is somewhat analogous to that of iron sulphides. Sulphide in excess of the solubility limit (about 0.30 per cent MnS. or 0.11 per cent S.) solidifies before the cast iron and occasionally occurs as primary crystallites in the pearlite areas. The rest of the sulphide remains dissolved in the mother liquor and separates out with the cementite-Austenite eutectic at about 1,130 degrees Cent. in a blobby or broken mesh-like form found in the cementite areas. It often is found near the junctions of the pearlite and the cementite.

The sulphide in cast iron, as the manganese proportion decreases, shows a compound structure of MnS and FeS, the manganese sulphide often being in the form of dove-gray crystals embedded in gobules of yellow-brown iron sulphide. This compound sulphide behaves more and more like iron-sulphide in cast-irons, the lower the manganese contents.

Such double sulphides occur when the proportion of manganese in the cast iron is insufficient to combine with all the sulphur present to form MnS. Some excess of manganese is necessary to insure the whole of the sulphur being present as MnS only, due in part to some of the manganese existing in other forms of combination—such as oxide or silicate, which leaves an equivalent quantity of sulphur free to combine with iron.

Sulphide of manganese is shown to be soluble in silicates, and the efficient removal of sulphur by manganese in mixer practice is explained by this fact.

Chemical analysis is shown to be insufficent for a proper knowledge of the metal for many purposes, since, as indicated above, it does not give sufficent data as to the condition in which the dangerous impurities occur. Microscopic examination is especially valuable in this respect, giving information as to their form, bulk, and distribution of such constituents.

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THE RELATION OF THE STEAM TURBINE TO MODERN CENTRAL STATION PRACTICE.*

By G. R. Parker.

Since the commercial introduction of the steam turbine into this country some seven years ago, so much has been said and written on the subject that it seems almost superfluous to attempt to add anything to the already large store of general information.

To a large number of readers a review of steam turbine principles will, therefore, be merely a repetition of ground covered many times. But in any branch of science an occasional brief return to basic principles is never out of place.

The objective of designers of all classes of steam prime movers has been the same; namely, the conversion of the heat of combustion into mechanical or electrical energy; and the medium employed has been water. It is true that the overall efficiency of our best steam prime movers is regretably low, due to the fact that so much heat has to be given to water before any of it can be converted into mechanical work. For example, the total heat per pound of steam at 150 pounds gage pressure is about 1,195 British thermal units. If steam be expanded to a 28-inch vacuum the total energy available in this range is only about 321 British thermal units. This 321 British thermal units is all of the total heat we are able to use, and in practice commercial machines may convert anywhere from one-half to three-fourths of this available energy into mechanical work.

Essential Difference of Types.

In this country we are interested chiefly in the Parsons and Curtis types of steam turbines. Briefly, the Parsons principle involves the continuous expansion of steam through alternate rows of moving and stationary blades, the former being attached to the spindle and revolving it, and the latter re-directing the steam against other revolving blades. The expansion of the steam thus occurs in both moving and stationary blades and motion is given the rotating element, both by the impact of steam on the moving blades and its reaction on leaving them. The machine is ordinarily called a reaction turbine and may in a general way be compared with a reaction water wheel.

The Curtis principle differs from the Parsons in that the expansion, instead of being continuous throughout the machine, is broken up into a series of pressure steps or stages. Each one of these contains a row of stationary nozzles which expand the steam through a certain range and direct it with large velocity against the moving buckets, through which it passes with practically no further expansion, thus moving the revolving buckets by impulse only. The expansion of steam, therefore, occurs only in the stationary element. This type of turbine is referred to as the impulse type and is somewhat analogous to the impulse water wheel. It is with the impulse turbine as invented by Curtis and perfected by Emmet that this present paper deals.

The Speed Problem.

The problem confronting all turbine designers has been to reduce the speed to such an extent that the turbine itself and the generator connected with it could be made to safely withstand the centrifugal strains. Other speed limits are imposed by the commercial electric frequencies in use in this country. Evidently 1,500 revolutions per minute is the highest speed for a 25-cycle generator and 3,600 revolutions per minute for 60 cycles.

The most efficient speed for any single impulse wheel driven by a moving liquid or gas is one-half that of the moving element. Steam exhausting from a pressure of 150 pounds gage through a suitable nozzle attains a velocity of about 4,000 feet per second. Therefore, half this speed, or 2,000 feet per second, should be the correct peripheral speed of a single impulse wheel placed in the path of the steam jet. Evidently such a peripheral velocity would necessitate an angular velocity far in excess of the highest commercial speeds. To reduce this high angular velocity and at the same time retain the efficiency of his machine, Curtis made use of two expedients. The first consisted in utilizing the velocity of a single expansion in more than one wheel, and thus dividing the initial velocity into two or more parts. This reduced the peripheral speed of each wheel in inverse proportion to the number of wheels. However, there are practical limits to the number of wheels which can be utilized in a single expansion; therefore, to still further reduce the speed, Curtis not only divided the velocity of a single expansion into two or more steps, but divided the total expansion range into two or more separate expansions.

A considerable amount of experimenting was done in the early days of manufacture to determine the correct number of stages and wheels per stage. Thus the first large turbines built contained two stages and three rows of revolving buckets per stage. Later investigations showed that for all large turbines the most economical results were obtained with not more than two rows of buckets per stage, and this is the present standard. With the exception of very large machines, four stages has been regarded as the correct number, although recent experiments indicate that possibly greater economy may be obtained with one or more additional stages.

One of the principal and most justly founded claims for the steam turbine is its relatively high economy at other loads than rated load. Even in the best designed reciprocating engines the best economy is obtained at one point, and at loads greater or less than this, cut off occurs either too early or too late for the cylinder proportions, and the result is a steam consumption per horsepower relatively higher at these loads. Since very few power loads can be made to hold constant at any given point, the average economy on a varying load may be considerably in excess of the best obtainable value.

System of Governor Control.

On the other hand, the Curtis principle permits high economy at all loads. This is due largely to the method of governing. Most impulse wheels have partial peripheral admission of steam; i. e., steam flowing through only a portion of the wheel at one time. Thus in the Curtis type the nozzles expanding the steam and admitting it to the first stage wheel extend over only a small portion of the wheel periphery. These nozzles are generally placed close together in a single continuous arc, although in the very large sizes two groups of nozzles spaced 180° apart are employed. The admission of steam to these nozzles is controlled by a corresponding series of valves which vary

*A paper read before the joint meeting of the American Society of Mechanical Engineers and the St. Louis Engineers' Club, Dec. 11, 1909.

in number according to the size of the machine. The opening or closing of these valves evidently permits the passage of steam through a greater or less number of nozzles. The steam emerging from two or more nozzles combines to form a continuous belt or stream of steam of constant width, determined by the width of the nozzles, and of length corresponding to the number of nozzles open. Governing is thus accomplished by automatically varying the length of this steam belt by the successive opening or closing of the admission nozzles. The steam thus arrives at the point of inlet at full pressure, regardless of the load, and whether one or all the nozzles are open it is expanded with practically no throttling. The result is evident in the steam consumption curves. At the fractional loads the steam consumption is relatively good, and as the load is increased the economy continues to improve, the load-water rate curve gradually becoming a nearly straight line. With such a machine it is possible to operate at least half the range of the machine with maximum and minimum economy varying not more than .5 per cent from the average. The advantages of this feature on a fluctuating load are obvious.

Desirable Operating Conditions.

The question is often asked as to what are the most economical steam conditions; i. e., initial pressure, vacuum and superheat. While there is much discussion on these points, the present American practice is becoming reasonably standardized. As to vacuum, there is no question that it is worth while getting the highest obtainable. Thenty-eight inches (properly speaking, 2 inches absolute) and even higher vacuum can readily be obtained with modern condensing apparatus. Steam pressures vary from 150 pounds to 250 pounds gage. In the smaller and medium sized plants probably 150 pounds to 175 pounds is about right, while in the larger ones 175 pounds to 250 pounds should be employed.

The arguments for and against superheat are numerous, but the consensus of opinion is inclined to favor a reasonable degree of superheat, at least in the large and medium sized plants. Superheat ranging from 50° Fahr. to 200° Fahr. is in common use. Regarding high pressure and high superheat it should be borne in mind that the percentage increase of available energy given the steam is much greater than the percentage increase in fuel necessary to produce these conditions.

Modern steam turbine practice has advanced so rapidly in the past few years that quite startling changes have been effected in some of the original turbine stations. Improvements in details of construction, and increase in speed, have greatly reduced the size and weight per kilowatt. About six years ago the first large turbines were installed in the new Fisk Street Station of the Chicago Edison Co. The first three machines were vertical, two-stage machines of 5,000-kilowatt capacity, and the fourth, installed somewhat later, was of the same capacity but of the five-stage type. Within the last year these four machines have been removed and replaced by four vertical machines of 12,000-kilowatt continuous capacity each. These occupy no greater space than the original machines, and no increase in the capacity of boilers supplying them was necessary. The Fisk Street Station now contains altogether ten similar machines of 12,000 kilowatts each. The Quarry Street Station of this same company at present contains three vertical machines of 14,000 kilowatts each and three more will be installed during the coming summer. The economies obtained in these plants are reflected in the rates which the Commonwealth Edison Co. is able to make its consumers.

A somewhat similar evolution is now under way in St. Louis. In 1905 the present Union Electric Light & Power Co. installed two 5,000-kilowatt, 500 revolutions per minute, 25-cycle, 6,600 volt vertical turbines. Later, two more 5,000-kilowatt machines were added, but with 60-cycle, 2,300/4,000 volt generators. The present plan, which is now well under way, is to replace all four machines with other turbines of 12,000-kilowatt capacity each.

Financial Aspects of Evolution.

The natural question is, can it possibly be a good business proposition to throw out four large turbines which have been in use only three or four years? That the answer was affirmative was due to three principal considerations.

(1) The larger machines could be installed without increase in floor space.

(2) The improvement in economy represented an annual charge which, if capitalized, would more than pay for the additional investment.

(3) Practically no new auxiliary apparatus or station piping would be required.

That these considerations were based on correct assumptions has been amply demonstrated. The first 12,000-kilowatt turbine has now been in commercial operation for several weeks.

In making this installation not only was it possible to utilize the original foundations, but even the base of the old turbine, which also constitutes the exhaust chamber and step bearing support, was utilized in building the larger machine. It was, therefore, not necessary to remove this base from the concrete, or break the connection to the condenser. In a general way it may be said that the old 5,000-kilowatt turbine was lifted bodily from its exhaust base and a 12,000-kilowatt machine installed in its place, without disturbing the condenser piping and auxiliaries. The increase in capacity means that in this portion of the station the kilowatt per square foot of station has been more than doubled. Even the original four 5,000-kilowatt machines were placed unusually close together, and when the remaining three are replaced by larger machines, it seems probable that the turbine portion of the Union Electric Light & Power Co. station will show a greater kilowatt capacity per square foot than any other station in this country.

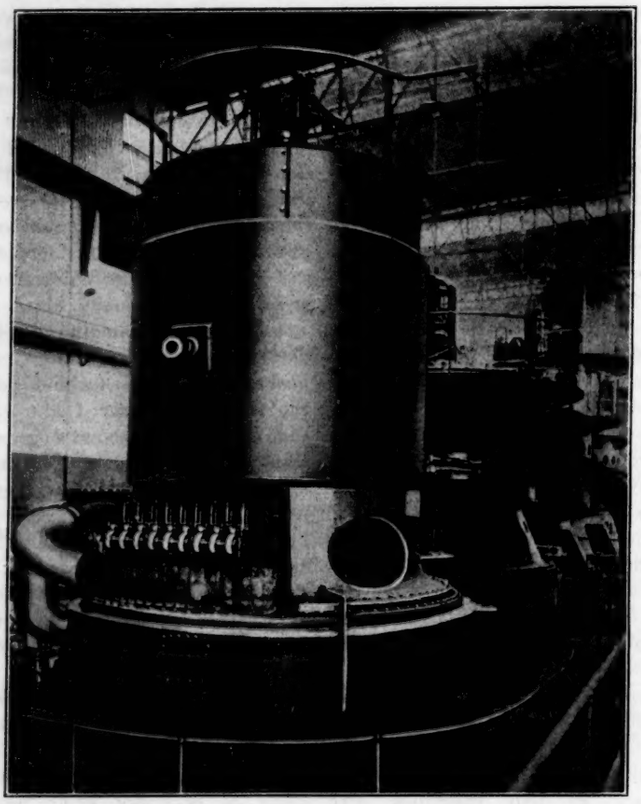
The Stronghold of the Turbine.

Aside from the increase in capacity, the improvement in steam economy is very large. Unfortunately, detailed test figures are not available at this time, but it is probable that the new turbine will show an improvement of at least 20 per cent over the one which is replaced, besides having a flatter load curve. On this basis considerations of economy alone would have warranted the change. In addition, this enormous increase in power has been effected without any considerable change in the existing piping and auxiliary arrangements.

Any steam turbine operating condensing with the usual pressure and vacuum derives roughly half of its power from the expansion of steam from boiler pressure to atmosphere, and the other half from the remaining expansion from atmosphere to vacuum. Thus in a four-stage machine, atmospheric pressure is reached between the second and third stages. A reciprocating engine operating under similar conditions would not derive its energy from the steam in this proportion. The average engine actually develops some 15 or 20 per cent of

its power from the expansion of steam below atmosphere.

A consideration of these facts brings us to the low pressure turbine. In a general way, it may be stated that a low pressure turbine is that part of the high pressure turbine which normally operates below the atmospheric line. In general, it is possible to build a low pressure turbine for compounding with a non-condensing engine, with the expectation of approximately doubling the capacity and halving the steam consumption, while the same thing may be done with a condensing engine to a less extent. Most



12,000-Kilowatt Turbo-Generator, Union Electric Light & Power Co., St. Louis.

condensing engines can be operated at their full capacity non-condensing with a slight adjustment of the valve gear. The increase in steam consumption of the engine alone with this arrangement will be between 15 and 25 per cent; but the low pressure turbine adds 90 to 100 per cent capacity, so that the net economy effected is worth going after regardless of the tremendous increase in capacity. Installations of this character were first made in this country four or five years ago, although greater interest has been stimulated during the last year or two. One of the early installations was in the plant of the East St. Louis and Suburban Railway Co., where an 800-kilowatt and a 1,000-kilowatt low pressure turbine were installed in connection with non-condensing engines.

The most notable installation is that recently made in the power house of the Interboro Rapid Transit Co. in New York City. This station contains the highest type of reciprocating engines, operating under the best possible engine conditions and developing an economy comparable with the best engine station in the country. It has, however, been possible to install in connection with one of these engines a low pressure turbine with a nominal rating of 5,000 kilowatts. It is probable that a detailed report of this installation will be published at an early date. For the present it is sufficient to say that the improvement in steam consumption of the combined engine and turbine has effected a saving in coal consumption of over 20 per cent and the combined capacity has been more than doubled. The turbine generator is of the induction type and runs permanently in parallel with the engine generator. With this arrangement it is unnecessary to provide any speed governor on the turbine. The engine governor takes care of both machines. It is interesting to know that in spite of the size and special character of this installation the machine was started and placed in commercial service without a hitch of any kind. A second machine of similar characteristics, but with a larger generator, is now being installed in connection with the second engine, and the present plan contemplates one turbine for each engine throughout the station. When complete, the station capacity will have been more than doubled without any increase in real estate or building investment.

What has been done in this connection can be accomplished on a smaller scale in almost any plant of 300 kilowatts or larger, operating reciprocating engines either condensing or non-condensing, provided proper condensing facilities are available.

Adaptability to Varying Conditions.

A valuable feature in connection with the Curtis low pressure turbine is that, owing to the fact that even with low pressure steam the primary admission nozzles only extend a portion of the way around the wheel circumference, it is possible to equip any low pressure machine with another set of nozzles primarily designed to expand steam from boiler pressure instead of from atmospheric pressure. A machine so equipped can be operated either as a strictly low pressure machine, or should the supply of exhaust steam fail entirely due to shut down of the engine or other reason, it can operate and carry its full capacity on boiler pressure steam alone; or it can be operated on a mixture of the two, in case the load exceeds the supply of exhaust steam. It should be remembered that these high pressure nozzles do not throttle the steam to a lower pressure, but are actually designed to economically expand it to the proper internal pressure of the turbine. Such a machine operating on high pressure steam only, will show an economy fairly comparable with an engine or turbine regularly designed for high pressure operation. The operation of these high pressure nozzles is automatically controlled by the main governor, and in practice it has been found possible to instantly cut off the low pressure steam supply without a noticeable variation in the speed of the turbine. This evidently makes a most flexible machine and one that accomplishes two most desirable results at comparatively small cost, namely, increase

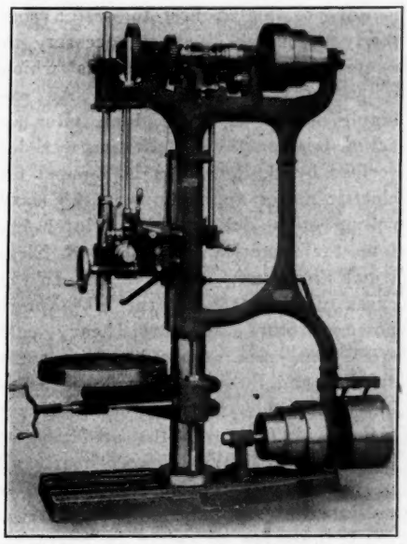
in capacity and decrease in steam consumption.

It is also perhaps worth while mentioning the enormous field which has been opened up by the strictly small turbine, that is, from 300 kilowatts down. These machines for the most part are designed to operate non-condensing, and the argument in their favor is that they are extremely simple machines requiring practically no attention or adjustment. The best proof of their extremely rugged construction is found in the fact that, out of 500 small turbines of 25 and 35-kilowatt capacity now operating in various parts of the country, a large percentage are in use by the various railroads for electric train lighting, under which condition it is hardly necessary to say that they receive a minimum of attendance with very few opportunities for the making of repairs. The confidence which the railroad companies place in these sets is evident from the fact that many of the more modern Pullman cars are equipped with electric fixtures only, no provision being made for gas light. Machines of this size and larger are also in general use as exciters for large alternators. Numerous cases are on record where such machines have run continuously for periods of three or four months or more without at any time shutting down.

In conclusion it may be said that the Curtis turbine has been built and placed in successful operation in sizes from 5 kilowatts to 14,000 kilowatts and at the present time even larger machines are under consideration.

A NEW KERN HIGH-SPEED DRILL.

The Kern Machine Tool Co., Cincinnati, has recently added a new design of 25-inch upright drill equipped with three-step cone and double back gears to meet the requirements for high speed twist drills. The manufacturers call attention to the great driving power incorporated in this design, in which the cone diameters are 9-inch, 11-inch and 13-inch for 3½-inch double belt driven at 440 revolutions per minute, which it is claimed gives a great increase in power compared with that ordinarily found in machines of this capacity. Heavy double back gears are mounted on the top housing between the spindle and the frictions, used when starting, stopping and reversing. The back gear changes are obtained through sliding gears and a positive clutch, and may be effected while the machine is running by a lever conveniently placed within easy reach of the operator. The greatest ratio through this mechanism is 12.5 to 1, so that the frictions, having the benefit of a high gear ratio, are required to transmit less than 1/12 of the actual torsion exerted at the spindle. The three-step cone and double back gears give nine changes of spindle speed. The tapping attachment is located on the top housing between the driving cone and the double back gears, and is operated through spur gears and clutches by a lever shown at the rear of the column, and by which the spindle may be started, stopped or reversed at accelerated speed. The feed gear is mounted on the sliding head and provides for eight changes from 0.006 inch to 0.05 inch per revolution of spindle. A feed plate indicates the position of the levers for any desired feed. All gears are made of steel and of a wide face and coarse pitch. All driving gears are protected by guards, which are removed in the illustration in order to show the arrangement of gears. An automatic stop and depth gage are also provided which permit tripping the spindle at any point within the limits of its travel. The leading dimensions of the drill are as follows: Drills to center of 25½ inches; greatest distance from spindle to base, 45½ inches; greatest distance from spindle to table, 32 inches; traverse of spindle, 10 inches; diameter of spindle, 1 9/16 inches, fitted for No. 4 Morse taper; driving pulleys, 14 x 4¼ inches; floor space, 30 x 70 inches; weight, 1,900 pounds.



KERN HIGH SPEED DRILL.

The Canadian Car Co., Ltd., has sold to Lee, Higginson & Co., and the Royal Securities Corporation, Ltd., Montreal, an issue of $2,350,000 first mortgage 6 per cent bonds, maturing in 1939.

METAL TIES AND CAST IRON RAIL CHAIRS.

The following correspondence will doubtless be of interest to many readers of THE IRON TRADE REVIEW. The answer contains information applicable to questions which are frequently asked, even by those who do not fall within the non-technical classification:

Guadalajara, Mex., Jan. 19, 1910.

To the Editor of the *Railway Age Gazette:*

A question has recently come up among some members of our small foreign club, and we have decided to apply to you, as authority on all railway matters, for the answer.

Mr. Newell, a well-known member of the American colony here, is the inventor of a metal sleeper or chair for securing railway rails in proper position, and when the accounts came of two recent costly disasters, one on the "Southern" and one on the "Rock Island" roads, caused by insecure fastenings, it started the discussion: Why do not the roads use metal sleepers and chairs, as in England and on the continent, to secure the rails?

One argument was that it was too expensive, but the account says either of the derailments named will approximate $100,000 loss. Now that amount will provide 100,000 chairs at $1 each, of 28,371 metal sleepers at $3.50 each.

Allowing 100 sleepers to the curve, it will provide for 283 curves. Allowing 200 chairs to the curve, it will provide for 500 curves, and this small number of either sleepers or chairs to each curve will give a factor of safety at least ten times greater than is now obtained with spikes alone, hence the argument of expense does not seem tenable.

So we respectfully refer the question to you. HENRY LEYTON.

[Sir Henry Leyton asks two questions. The use of metal sleepers or ties, and the chair system is separable. Metal ties have not yet shown good results with heavy axle loads and high speed combined. They do apparently good service on the Bessemer & Lake Erie with heavy loads at low speed, and good service in Europe with light loads and high speed. In this country the inverted-trough ties have broken down and those of rigid forms have developed dangerous tendencies. The breakage of fastening clips has been alarming and in some cases disastrous. These clips have been designed to hold the rail firmly to the ties, with no elasticity and, indeed, with no resiliency. The up-

ward wave traveling along the rail in front of the rolling load probably needs to be reckoned with. In frozen ballast, with the ties firmly held, and with rigid clips that are strong enough, the upward wave has some dangerous work to do.

The English chair system has so many economical advantages that it has always been attractive. The rail being raised about an inch and three-quarters above the tie enables the trackman to tamp up the sleepers and maintain good surface with much greater precision and in much less time than where the rail bears directly on the tie. The maintenance cost of chair renewals is minute. The worn out and broken chairs are melted and new castings made at the cost of only a few cents each, and they last a great deal longer than does a tie plate. The trouble is that cast iron chairs probably cannot be made strong enough for heavy high speed.

About 20 years ago the Pennsylvania railroad was supplied by the London & North Western Railway Co., of England, with 1 mile of rails, chairs, fastenings and metal sleepers, and another mile of the same material with wooden sleepers. Also, the London & North Western sent over a few skilled men to see to the installation of this track in the Pennsylvania lines. It was only a very short time before it was completely broken up.—Editor.]

ELECTRICALLY-DRIVEN ROLLING MILLS.

Before the introduction of the electric motor for driving rolling mills, the question of design was largely a matter of guesswork, and of profiting by successive errors and mistakes. This hit-or-miss policy was not conducive to efficiency and economy, or to uniformity or quality of the finished product.

With the steam engine drive, there is no way of telling easily the work done at each pass. With electric motor drive, on the other hand, the mill operator is able to see at a glance by his instruments the work done at each pass, and this fact has enabled the engineer to design the mill in such a way as to equalize the efforts, and so to avoid high power peaks, thereby decreasing the power of the prime mover and hence the first cost of installation and the cost of operation.

The elasticity or overload capacity of the electric motor is also very much in its favor, as it is characteristic for developing a uniform torque throughout its entire revolution, and independently of its speed of rotation. The steam engine, with a reduction of speed, develops correspondingly less energy; whereas, in rolling mill work, the opposite should be the case, as the speed of the steel should be low, as it enters the rolls, and faster as it lengthens. This disadvantage of the steam engine can be overcome by a proper design of electric motor drive. In the case of overload requirements, the motor can take more and more current from the line as it is required, even up to an overload of three times the normal capacity of the machine for the short time the extra power is required. When a motor generator flywheel set is used the steady horsepower supplied to the circuit usually varies from one-fifth to one-tenth the maximum output of the main motor.

Even with electric drive, however, it is not possible at first to design correctly the flywheel effect necessary to overcome the excessive loads which obtain in rolling mill work. An example of how this was done, after an actual trial on the installation, was described by B. R. Shover in a paper on electric motor applications in the Gary rolling mills, delivered last March before the American Institute of Electrical Engineers in New York. In the cases of the 6,000 and the 2,000-horsepower motors, at Gary, heavy cast steel rims were attached to the rotor spiders, and these were made so as to be replaceable by rims of different weights. Of course the problems at the Gary Steel Works were nearly all of them entirely new, and practically no data were available.

The question of safety in operation is another point greatly in favor of the electric motor. With the steam drive, when a piece happens by accident to leave the rolls, which often occurs in reversing rolls, the engine is apt to race on account of the sudden drop in the load. Such an eventuality can be provided against in the case of the electric motor drive by employing a controlling device (with motor generator flywheel sets) which imposes a powerful and immediate braking effect on the motor when a predetermined speed is exceeded.

In spite of the claims by some of the adherents of steam-driven rolling mills, that the steam drive is more economical than electric drive (and this, by the way, is disputed by many rolling mill experts), it is a significant fact that not only are most of the new mills being equipped with electric drive, but many of the older mills are scrapping their old steam-driven plant and substituting therefor the electric drive. In large mills where blast furnace gas is available, the use of gas engine generator sets will undoubtedly prove more economical than any steam engine plant. This has been done successfully and economically at Gary and at many other places.—*Electrical Review and Western Electrician.*

SPECIFICATIONS FOR SPRING AND RIGID FROGS.

From the report of the Committee on Track of the American Railway Engineering and Maintenance of Way Association appearing in Bulletin 119 for January, 1910, we abstract the following specifications for rigid and spring frogs:

General.

The railway company will furnish the manufacturer one copy of the specifications and drawings.

The drawings will show the rail sections, splice drilling, angle, alinement and general dimensions.

The drawings are intended to cooperate with and form a part of the specifications. Dimensions should not be scaled. Anything which is not shown on the drawings, but which is mentioned in the specifications, or vice versa, or anything not expressly set forth in either, but which is reasonably implied, shall be furnished the same as if specifically shown and mentioned in both. Should anything be omitted from the drawings or specifications which is necessary for a clear understanding of the work, or should any error appear either in the drawings or specifications affecting the work, it shall be the duty of the manufacturer to notify the company, and he shall not proceed with the work until instructed to do so by the company.

Materials.

Rail shall be first quality, of the section ordered, as called for by the company's rail specifications.

Filling between the main and wing rails, and between the main and easer rails, shall be rolled steel.

Raising blocks must be of cast steel.

Solid foot guards and beveled filler blocks not presenting a running surface may be of cast iron.

Foot guards, when made of steel, shall be not less than ⅜ inch thick, of width shown on plans, shall fill the space between head and base of rail, and shall be bolted to the web of rail by bolts not less than ¾ inches in diameter. These foot guards shall be supplied at all places where protection is needed, and where conditions will not allow the above specified cast iron foot guards.

Bolts shall be of double refined iron. Bolt iron shall have a tensile strength of not less than 48,000 pounds per square inch, and an elongation of not less than 15 per cent in 8 inches. When nicked on either side and then broken, the fracture shall be entirely fibrous and free from flaws and unwelded seams. Bolts must be round and true to size, with United States standard square heads and nuts. Threads must be accurately cut and nuts must have a wrench-tight fit. Each bolt must be provided with an approved head lock made of material not less than ¼ inch thick, preventing the bolt from turning.

and a nut lock of approved pattern large enough to give full bearing for the nut. A ¼-inch cotter pin must be placed outside of and close up to the nut after it is tightened. Beveled washers must be used wherever necessary to give head and nut a full square bearing; they must be wide enough to act as head locks. Bolts must be long enough to allow the nuts to be brought out from under the head of the rail, with a suitable washer not less than ½ inch thick, so that the nuts may be readily tightened with an ordinary wrench.

Rivets shall be of good quality mild steel, with an ultimate tensile strength of 50,000 to 54,000 pounds.

Reinforcing bars shall be of wrought iron or soft steel.

Plates shall be of rolled steel.

Springs shall be of best quality spring steel, and of dimensions and capacity shown on the plans. They shall meet the following tests:

(a) Each spring shall be placed on the testing machine and forced down solid four times.

(b) After the foregoing, each spring shall be placed on one end on a flat plate, and the distance between the plate and the other end of the spring measured by means of the standard depth gage; this measurement being the free length of the spring. The free length must conform to the plans within ⅛ inch.

(c) Double springs shall be assembled and a load at least 25 per cent greater than the rated capacity of the spring shall be applied for 30 seconds. Upon release neither spring must vary from its original free length. If either one does so vary, it shall be rejected.

(d) The inner and outer coils of springs shall be coiled in opposite directions.

Spring covers shall be made of malleable iron.

Braces shall be made of malleable iron.

Stops and hold-downs shall be made of soft steel.

Anti-creeping device shall be made of soft steel.

Workmanship.

The workmanship must be first-class. Bends shall be made accurately and with care, so as not to injure the material. They shall be in arcs of circles and not angles.

It is desired that rails be bent cold. If heating is resorted to, it shall be done in such a manner as not to injure the rail. Welding in any part of the frog will not be permitted. Planing shall be true, and all abutting surfaces fit closely. Ends of rails shall be cut at right angles to the axis of the rail, except where otherwise shown on the plan. All burrs shall be removed.

Fillers shall fit the fishing angles and the web of the rail tight for a distance of ½ inch above and below the base and the head, respectively, and still maintain the required flangeway. Where the brand of the rail interferes with the fit of the filler, the brand shall be chipped off flush. Fillers shall be grooved or cut out to fit over rivet heads.

Heel raising blocks shall fit the head, base and web of rail equally as well as the fillers are fitted.

Beveled fillers and solid foot guards shall fit the rail sufficiently well to maintain the required spacing.

The diameters of the rivets shall be of full size shown on plan, and the diameters of the rivet holes shall not be more than 1-16 inch greater than the diameters of the corresponding rivets. The rivets shall be of sufficient length to provide full, neatly made heads when driven. They shall be driven tight, bringing all adjacent parts in contact.

Rivet heads, when not countersunk or flattened, shall be hemispherical and of uniform size for the same size rivets. They shall be full and neatly made, and concentric with the holes. When the rivet heads are countersunk they shall be flush with the plate, and fill the holes.

Reinforcing bars shall fit the fishing angles and web of rail throughout their length.

Plates shall be flat and true to surface.

Springs shall have the ends cut square with the axis, so that when the spring is placed on end on a flat surface it will stand perpendicular.

Spring covers shall be of such dimensions as to permit a proper working of the springs, and shall be provided with a spring bearing for each end of the spring.

Braces shall fit the head and web of rail accurately.

Stops shall be so placed on plates as to hold the wing rail at 1⅞-inch opening at the ½-inch point. Hold-downs shall fit stops so as to allow at least 2 inches horizontal play and not more than ⅛ inch vertical play.

The anti-creeping device shall fit accurately to the parts of the frog or angle bars.

Holes shall be drilled from the solid. No punching will be permitted except in case of bottom plates and washers. Drilling shall be accurately done, on bevel where necessary, and holes shall be made 1-16 inch less in diameter than the bolt to be used. Then the parts shall be assembled and the holes reamed so they are straight and true, with no offsets between the adjacent parts, and of such size as to give the bolts a driving fit for their entire length.

In lieu of the above specification for drilling and reaming, the manufacturer may assemble and accurately fit all the parts, including the rail and fillers, before any drilling whatever is done; after the parts are securely clamped in their correct positions, the holes may be drilled through the entire mass to the exact diameter of the bolt.

The number of the frog, maker's name, weight of rail and the date shall be plainly stamped with ¾-inch figures and letters on the flare of one wing rail for rigid frogs and the flare of both wing rails for spring frogs.

No paint, tar or other covering shall be used before inspection.

The alinement and surface of all finished work shall be even and true, and shall conform to the angles specified.

Inspection.

Material and workmanship shall be at all times subject to inspection by a duly authorized representative of the company, who shall examine the material before it is worked in the shop. He will inspect the work during progress and will also inspect the finished product, with power to reject materials and workmanship found to be unsatisfactory. He shall have free access to the shops and mills at any and all times during the progress of the work.

All facilities, labor and tools necessary for the shop inspection shall be furnished at the expense of the manufacturer.

DAYTON IMPROVED GRINDER.

We illustrate herewith the redesigned cutter and reamer grinder manufactured by the Miami Valley Machine Tool Co., Dayton, O. In these machines the table is operated by a crank handle in front through a pinion and rack instead of by a hand lever at the end of the table as formerly. The tables swivel for taper grinding and are furnished with end

THE DAYTON GRINDER.

graduations; the emery wheel head is also arranged to swivel instead of the body of the machine. The only vertical adjustment required is when backing off reamers, which is provided for by an adjusting ring on the base of the wheel head. The adjustment is made quickly and is sufficient for any reamer within the capacity of the machine. On the No. 1 machine the internal grinding attachment seen in the rear wheel head is always intact, being swiveled on the wheel base, the wheel head being merely swiveled to the rear and the internal arm brought to the proper position. The plain machine has a capacity for work 8 inches diameter by 20 inches in length between centers, or for milling cutters up to 16 inches diameter, while the No. 1 universal has a capacity for work 8 inches diameter by 16 inches long between centers, and milling cutters up to 16 inches diameter. Internal attachment, 6 inches diameter by 4 inches long, and form cutter centers 5 inches diameter by 11 inches long, with vise 2 x 3 inches. In both machines the tables swivel to a taper of 4 inches per foot.

NEW DISTRICT

To Be Tested For Iron Ore in Marquette Range.

Republic, Mich., Feb. 24.—A work that will be watched with interest on the Marquette range, in that it will determine the merits of a new field, is that which Duluth interests have arranged to carry on in the vicinity of the Dead river hoist, so-called. Lands in Sections 7, 8, 17 and 18, 48-26, comprising 1,200 acres, will be tested. The nearest mines are in the Teal lake basin, at Negaunee, some five or six miles distant. Some desultory exploring was done years ago, but without results, and until what appeared to be an outcropping was discovered last summer it was believed the field lay entirely outside of the Huronian or iron-bearing formation. However it appears now that the acreage under option to the Duluth men, and other lands in that vicinity, are located in a territory that can and may bear ore. Both to the east and the west the formation is granite, but there is an intrusion from the iron-bearing formation up into this granite which covers a very considerable acreage. The Duluth interests will first explore with test pits, and if the conditions warrant they will put in drills. The options run for two years and provide for a sliding scale of royalties to be paid in case mines are discovered. The fee owners are Marquette men.

The United States Steel Corporation's Oliver Iron company, which a number of months ago organized a police force on the Mesabi range for the protection of its mining properties, is extending the service to other districts of the Lake Superior region. David F. Foley, a former Marquette range man, is the superintendent of the new department, and when his various forces are organized he will have in the neighborhood of 100 men under him. The officers are uniformed and have the same power as city police. There will be two men at most of the mines, and they will alternate in night and day work. The Marquette range force is the latest to be formed.

ITALIAN ROLLING MILL.

The large Italian iron and steel works at Terni (Societa Alti Forni ed Acciaieria Terni) have decided to build an armor-plate rolling mill, and have already placed the contract for the whole plant with the well-known French firm of Schneider & Co., Le Creusot. The capacity of the mill is to be equal to the rolling of ingots up to 100 tons in weight. It will be built as a two-high reversing mill, with rolls 4 feet diameter and 15 feet long. It is possible to obtain water power in Terni, but as reversing is not possible with water wheels, electric driving naturally commended itself. The whole of the electric plant will be constructed according to the designs and patents of the Felten & Guilleaume Lahmeyer Works, Frankfort-on-Main. The mill is to be driven by two direct-current motors arranged in tandem, and of a maximum output of 15,000 horsepower at 90 revolutions per minute. Current will be supplied by three generators connected in series, each of which will be coupled to a water turbine of 2,600 horsepower. In order to equalize the fluctuations of load a 50-ton cast steel flywheel will be provided. The speed of the turbines will vary from 450 to 550 revolutions per minute. Special care has been taken to assure quick reversing of the rolls. Provision also is made so that should an ingot get jammed between the rolls the mill can be reversed and the ingot pushed back before damage is done to the rolls.

NEW PUBLICATIONS.

THE WHITE STAR OIL FILTER.—Leaflet distributed by the Pittsburg Gage & Supply Co., Pittsburg, Pa.

REPORT OF A FIRE, LOAD AND WATER TEST MADE UPON REINFORCED CONCRETE FLOOR ARCHES.—Test conducted by Ira H. Woolson, E. M., in conjunction with City Building Bureaus of New York; Columbia University, New York City.

INDUSTRIAL RAILWAYS. — Booklet distributed by Ernst Wiener Co., New York City.

JEFFREY SPIRAL CONVEYERS.—Booklet distributed by the Jeffrey Mfg. Co., Columbus, O.

TESTS OF TWO TYPES OF TILE-ROOF FURNACES UNDER A WATER-TUBE BOILER.—By J. M. Snodgrass, has been issued by the Engineering Experiment Station of the University of Illinois as Bulletin No. 34. This bulletin reports a short series of boiler trials made for the purpose of comparing boiler performance when operating with two types of furnace roofs. Gratis upon application to Director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

SEWERS, TANKS AND WALLS.—Booklet issued by the North Western Expanded Metal Co., Chicago.

FIRE TAX AND WASTE OF STRUCTURAL MATERIALS IN THE UNITED STATES.—By Herbert M. Wilson and John L. Cochrane; Washington, United States Geological Survey.

TESTS OF TUNGSTEN LAMPS.—By T. H. Amrine and A. Guell; distributed gratis by Engineering Experiment Station, University of Illinois, Urbana, Ill.

A PRIMER ON EXPLOSIVES FOR COAL MINERS.—By Chas. E. Munroe and Clarence Hall; Washington, D. C., U. S. Geological Survey.

THE INSULATION OF PIPES AND BOILERS.—Booklet distributed gratis by the H. W. Johns-Manville Co., New York City.

HOW 4 CARS OF COAL DID THE WORK OF 5.—Booklet distributed gratis by the H. W. Johns-Manville Co., New York City.

REPORT OF A FIRE, LOAD AND WATER TEST MADE UPON REINFORCED CINDER CONCRETE FLOOR ARCHES.—A test made on reinforced concrete floor arches by Ira H. Woolson, E. M., of Columbia University, in connection with the City Building Bureaus of New York City, Jan. 14, 1909. Price 25 cents.

"PITTSBURG" STEAM & OIL SEPARATORS.—Booklet by the Pittsburg Gage & Supply Co., Pittsburg, Pa.

REPORT OF PROCEEDINGS OF SEVENTEENTH ANNUAL CONVENTION OF INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASS'N.—Edited by A. L. Woodworth, Lima, O., and covering proceedings of the 1909 convention held at Niagara Falls, N. Y., Aug. 17, 18 and 19.

NEW CATALOGS.

PROTECTIVE COATINGS FOR IRON AND STEEL.—The Goheen Mfg. Co., Canton, O., is distributing a 16-page 8 x 10 inch booklet containing a number of excellent illustrations of widely separated and diversified plants and structures in which its protective coatings have been employed.

MOLDING MACHINES.—The Arcade Mfg. Co., Freeport, Ill., has issued its catalog No. 23, 22 6 x 9-inch pages, describing its line of molding machines of various types and any sizes from those dealing with the smallest work up to machines for handling molds for castings of several thousand pounds in weight.

INTERCHANGEABLE DIES.—The National Machinery Co., Tiffin, O., is distributing a 6-page booklet descriptive of its new National interchangeable case dies for machine use, together with the die grinder designed specially for their upkeep.

EXHAUST FANS.—The American Blower Co., Detroit, Mich., has issued bulletins 271 and 272, descriptive of "ABC" cast iron exhaust fans and "Dixie" exhaust fans, respectively. Both are 8 pages, of its standard catalog size.

STEEL PLATE FANS.—Catalog 127 of the Green Fuel Economizer Co., Matteawan, N. Y., 56 6 x 9-inch pages, illustrates and describes the steel plate fans built by the company for all purposes in engine, belt and motor driven types.

FIRE BRICK.—A 78-page 4 x 6¾-inch catalog issued by the Scioto Fire Brick Co., Sciotoville, O., describes its line of fire brick for blast furnaces, hot blast stoves, open-hearth furnaces, soaking pits, cupolas, glass works, etc.

STEAM TURBINES.—Bulletins Nos. 9 and 10, by the Kerr Turbine Co., Wellsville, N. Y., 8 and 16 6 x 9-inch pages, respectively, describe the Kerr steam turbine in horizontal and vertical types, with illustrations showing its construction and application to various services, driving generators, pumps, blowers, etc.

ELECTRIC LIGHTING.—The General Electric Co. has issued a pamphlet on the subject of building lighting, which contains reference to a number of important installations of lamps having tungsten and tantalum filaments. Bulletin No. 4689, recently issued by this company, is devoted to the subject of ornamental street lighting.

ELECTRICAL APPLIANCES.—Bulletin No. 4714, issued by the General Electric Co., describes a volt-ammeter recently designed ofr the testing of automatic railway signals and arranged for four capacities or combinations, so that two voltage ranges and two current ranges, or three current ranges or one voltage range can be obtained. Bulletin No. 4715 describes G. E. 210 railway motor, with a detailed description and speed table, characteristic curves and dimension diagrams.

GREAT INCREASE

In Capacity of Plant of Youngstown Company Proposed.

The Youngstown Iron & Steel Roofing Co., Youngstown, O., makes the following announcement concerning its proposed improvements, to which some reference has been made in these columns:

Our plans at present provide for the construction of a 72-inch 3-high plate mill, having a capacity of about 200 tons per day. This mill will be served by two continuous slab heating furnaces.

One 30 x 60-inch jobbing mill, having a capacity of about 40 tons per day of light plates and sheets ranging in size from 12-inch to 24-inch gage and 54-inch and narrower in width. This mill will be equipped to furnish material in blue annealed as well as box annealed and cold-rolled quality.

One 30-inch x 32-inch finishing mill with 30-inch x 36-inch roughing, equipped for the manufacture of crucible steel plates and sheets.

The galvanizing department is being equipped to galvanize sheets up to 54 inches in width, and when the present improvements have been completed, this company will be in position to furnish galvanized sheets and plates ranging from 10 to 30-gage and 54 inches wide and narrower.

The contract will be placed very shortly for a building 100 x 300 feet, which will be in addition to the present pressed steel department. This will greatly enlarge the output of this department, which manufactures cold pressed steel shapes for the agricultural implement trade.

The 2,500 horsepower Cooper Corliss engine, mention of which has been made previously, will be installed, with connections for driving a low-pressure turbine generator, which, however, will not be placed at present.

When the present improvements are completed, this company will have an approximate output of 50,000 tons of plates; about 70,000 tons of black sheets; 20,000 tons of galvanized sheets; 10,000 tons of roofing; 1,000,000 square yards expanded metal lathing; 500,000 square yards heavy expanded metal for reinforced concrete work; about 10,000 tons of cold-pressed steel shapes, annually.

TURNED INTO COPPER PROPERTIES.

The Goldfield mines; Goldfield, Nev., which have yielded so much gold during the past four years as to make the camp rank foremost as a gold producer, are being turned into high-grade copper properties in the lower levels.

Little attention has been paid to copper and less has been said about it while gold was abundant. But the volume of high grade copper ore which has been uncovered is attracting much attention of late. The deposits recently uncovered and traced for some thousands of feet are valued into the millions.

ILLINOIS MALLEABLE IRON CO. DOING MUCH NEW BUILDING.

The Illinois Malleable Iron Co., 1801-1825 Diversey boulevard, Chicago, malleable iron, gray iron and brass founder, jobber, plumbers' supplies, etc., advises that it has several buildings under construction, which are of the value of $190,000. It expects to start a new foundry within 30 days, 164 x 730 feet, which, added to its present capacity, will allow an annual output of 30,000 tons of castings. A one-story brick addition is being constructed for additional annealing capacity, and it has under construction a six-story warehouse 80 x 150 feet, which will be used for assembling its house heating boilers and other specialties. Necessary auxiliary buildings, such as core-making and cleaning rooms, were completed some time ago. With the new additions the plant will cover 24 acres. It will have in operation six melting furnaces of 16-ton capacity to each heat.

Its equipment is of the most modern type, and all the new building is in addition to its older units, which have been in operation for 25 years. Its output includes malleable and gray iron fittings for steam fitters and plumbers' use. Of this capacity, 60 per cent will be taken up with this work, and the remainder will be for the manufacture of medium-weight castings of all kinds, its work being especially suitable for castings for automobile purposes. It further advises that all departments are busy and it has already sold 70 per cent of the additional capacity which it expects to become available within the next 30 days.

LEAD MINE ACQUIRED.

The Frontenac lead mine, near Kingston, Ont., which was worked over 30 years ago, being the first lead-producing property in Ontario, but has been idle for some years, has been acquired by a new company to be known as the Canadian Smelting Co., Ltd., capitalized at $500,000, including Orlando L. Cushman and John C. Crapser, of New York, and Fred L. Dewey, president Citizens' National Bank of the United States. The company will begin mining operations and erect a general smelter as soon as the weather permits.

COPPER ROLLING MILL

Business and Stock Sold by the Crucible Steel Co. to Hussey & Co.

Announcement is made that C. G. Hussey & Co., Pittsburg, have purchased from the Crucible Steel Co. of America the business and stock of its copper-rolling mill at Thirtieth and Smallman streets, thereby acquiring control of the copper mill business in the Pittsburg territory. The transaction does not include real estate or machinery—only the business and stock—although the machinery may figure in a deal later. The copper rolling mill, which has a capacity of about 500 tons, is one of the oldest industrial plants in western Pennsylvania. In recent years it has been operated as a part of the Park Works of the Crucible Steel Co. There have never been more than two copper mills in this vicinity, the Hussey & Co. mill and the Crucible Steel Co.'s works. It is expected that as a result of this deal, C. G. Hussey & Co. will make some extensions to the Second avenue plant, although officials of the company are not in a position to announce details at this time.

NEW ANDREWS & HITCHCOCK FURNACE BLOWN IN.

The new furnace of the Andrews & Hitchcock Iron Co., Hubbard, O., was successfully blown in on Feb. 19.

This is the first of the new furnaces to go into operation this year. It is the latest modern furnace, designed and built by Julian Kennedy, engineer, Pittsburg, and Arthur E. L. Dette, engineer in charge of construction. The William B. Pollock Co., Youngstown, furnished the iron work, and the Stowe-Fuller Co., Cleveland, all the fire brick. Niles brick were used for furnace lining, National brick for the stoves, and Empire brick for pipes and connections.

The furnace stoves and connections make one of the best and most complete blast furnace plants in the Mahoning valley.

PHOENIX LEAD CO.

The Phoenix Lead Co., St. Louis, is the name of a corporation organized by the bondholders of the Madison Lead & Land Co. to take over the property of that company, following the foreclosure of a trust deed. The property so obtained contains a number of lead mines which it is declared will prove to be very valuable after suitable development work. The Phoenix company does not intend to operate the mines, but will lease the land to another concern.

NEWS FROM MANY INDUSTRIES

(In order to assist the post offices in delivering letters to new concerns, it is suggested that the names of incorporators be written in the lower left hand part of every envelope addressed to such new companies.)

New Buyers:—

The following manufacturing companies have filed articles of incorporation:

Beaumont Iron Works, Beaumont, Tex.; $100,000; by C. L. Wallis, W. C. Averill and T. S. Reed.

The St. Louis Safe & Vault Co., St. Louis; $20;000; Christian Claudy, Louis J. Sharp and John C. Banks.

The Davis Foundry, Edgewater, N. J.; $25,000; by Charles E. Davis, Howard W. Davis and William J. Aller.

The Osage Foundry & Machine Co., Bartlesville, Okla.; $10,000; by H. L. Levy, E. H. Haubold and E. M. Haubold Jr.

The Hamden Foundry Co., Hamden, O.; $10,000; by J. F. Ogler, A K. Matterson, O. Q. Sellers, J. N. Straten and W. H. Henry.

The Chicago Metal Wheel Co., Chicago, Ill.; $15,000; tools and machinery; by John C. Armstrong, C. H. Staples, George M. Hoke and Ednyfed H. Williams.

The Hancock Mfg. Co., Sandusky; $100,000; glass making machinery; by W. E. Guerin Jr., M. C. Pusch, R. K. Ramsey, A. K. Nier and Clara Horn.

The Boyd Steel Springs Co., New York City; $10,000; Henry B. Boyd, Charles A. Cook, both of 505 State street, Brooklyn; Archibald R. Boyd, 128 Broadway, New York City.

The Malden Mfg. Co., New York City; $30,000; machinery, tools and metal novelties, etc.; by J. C. Kopf, Brooklyn; M. Finkelstein, Ozone Park, L. I.; E. D. C. Sperry, New York City.

The Georgia Plow & Implement Co., Norcross, Ga.; $50,000; by Samuel C. Dunlap, Gainesville, Ga.; Don K. Johnson, and Milton L. Livey, both of Atlanta, Ga., and others. The company was incorporated to take over the Buchanan Plow Co.

New Construction:—

The M. Pumely Co., Laporte, Ind., has erected a new gray iron foundry, which will have a daily capacity of 100 tons.

G. Brucker has been issued a permit to build a one-story brick foundry addition at 808-814 Lincoln street, Chicago, estimated to cost $4,200.

Indiana Brass & Iron Bed Co. has added to its foundry equipment two five-ton Newten cupolas made by the Northern Engineering Works, Detroit.

The Reading Iron Co., Reading, Pa., has been issued a permit for the erection of a one-story forge, 50 x 100 feet, with a slag roof, estimated to cost $1,000.

The improvements which will triple the floor space of the plant of the Ohio Steel Foundry, Lima, O., are nearing completion. The estimated cost of the improvements is over $15,000.

Wickwire Bros., Cortland, N. Y., are constructing the third 30-ton open hearth steel furnace at their plant, which will enable the company to have two furnaces in operation at all hours.

The Maddox Foundry & Machine Co., Archer, Fla., is planning to improve its plant, making an addition 40 x 118 feet to the machine shop and 30 x 40 foot additions each to the pattern and blacksmith shops.

The Toledo Iron Works Co., Toledo, O., builder of steam shovels, has signed a contract to remove its plant to Evansville, Ind. It is estimated that $250,000 will be expended on the new buildings at Evansville.

The Standard Saw Mfg. Co., Louisville, Ky., has taken out a permit to build a five-story brick building, fronting on Shipp street, estimated to cost $28,000. The building is to be completed by July 1.

The Aluminum Casting Co., Buffalo, which recently purchased several acres on Elmwood avenue, has filed plans for the first of several buildings which it will erect on the property. The structure is one-story and estimated to cost $30,000.

The Allen Engineering Co., Hill building, Memphis, Tenn., is planning the construction of a plant for fabricating bridge and building material on a site including 10 acres. Practically all the machinery proposed to be installed has been ordered.

Announcement is made that the Gramm Motor Car Co., of Bowling Green, O., will build a $500,000 plant adjoining the works of the Lima Locomotive & Machine Co., Lima, O. The plant now operated at Bowling Green will be used as an auxilliary.

The Henry J. Hartman Foundry Co., Grand Rapids, Mich., has completed a new core house 25 x 147 feet. This is a part of an extensive rebuilding campaign carried through the past two years, which has resulted in the almost complete re-construction of the plant.

Albert Steinfeld and Manuel King, are planning to organize a company, to build a foundry and machine shop at Tucson, Ariz., at an estimated cost of about $5,000. The machine shop will be 40 x 60 feet, and the foundry 40 x 40 feet. It is proposed to do a general foundry business, as well as fabricate structural iron.

The C. W. Raymond Co., Dayton, O., manufacturer of clay molding machinery, has had plans prepared for new shops at Bolander avenue and Broadway, estimated to cost $100,000. The company recently acquired an eight acre tract in Edgmont, and will build a modern steel and brick factory.

The American Radiator Co., is completing a steel structure at its Springfield, O., plant, which will be used for a foundry. The new building is being constructed in a unique manner, all about the old brick building which is now used for the foundry. The new building will afford twice the floor space of the old, and is one story.

The Commercial Mfg. Co., East Peoria, Ill., manufacturer of agricultural implements, has decided to build a new office and warehouse and to add to the facilities of the machine shop. This being the busy season for agricultural lines, work will not be begun at present, but it is expected will be taken up during the dull months of the summer.

Plans for the proposed machine shop to be constructed at North Tonawanda, N. Y., by the American District Steam Heating Co., provide for a reinforced concrete building, 240 x 250 feet, two stories. The contract for the building has been let to the Durolithic Co., of North Tonawanda, at a price of $100,000. Work will be started about March 15.

Repairs at the furnace of the Delaware River Steel Co., Chester, Pa., which was recently damaged by fire, are proceeding rapidly. One of the engines has been rebuilt and placed in operation, so that the blowing apparatus can be worked, and work is proceeding on the other engine. The company succeeded in preventing serious damage to the blast furnace by banking.

The Hydraulic Pressed Steel Co.,

Cleveland, is having plans prepared by the Forest City Engineering Co., for an addition to its plant at East 61st street. The building will be of brick and steel, 85 x 245 feet. The iron and steel construction work has been awarded to the National Iron & Wire Co. The new building will include a large press and shear shop, a garage for trucks, and a new office building. ing is to be completed by fall.

The Southern Steel Casting Co., recently organized at Chattanooga, will install an electric steel furnace of either the Heroult or Girod type, for the production of high grade electric steel castings. The size of castings will range from 1 pound up to 5 tons. The electric power required will be obtained from a large hydro-electric plant now being put in on the Tennessee river by the Chattanoga & Tennessee River Power Co.

General Industrial:—

The Pneumatic Jack Co., Louisville, has increased its capital from $100,000 to $150,000.

The Waukesha Expanded Metal Co., Waukesha, Wis., has filed notice of dissolution.

The Erie Engine Co., Erie, Pa., has increased its capital stock from $100,000 to $300,000.

The Security Stove Mfg. Co., Kansas City, has increased its capital stock from $60,000 to $80,000.

The Ferro Machine & Foundry Co., Cleveland, has increased its capital stock from $383,000 to $433,000.

The Aetna Foundry & Machine Co., Springfield, Ill., has certified to the state authorities its dissolution.

The secretary's report of the last year's business was very satisfactory, and the prospects for the future look bright.

The McKinnon Chain Co., which is capitalized at $1,000,000, has begun operating its plant on Ellicott creek, at Tonawanda, N. Y.

The Lackawanna Steel Co. has filed certificate increasing its capital stock from $60,000,000 to $70,000,000 by the issuance of $10,000,000 preferred stock.

The Direct Drive Mfg. Co., Indianapolis, manufacturer of the Parkinson transmissions, advises that it will be six months or a year before it will be in a position to consider manufacturing.

The Bennett Steel Works Co., 4029 Hamilton avenue, Cincinnati, has filed a deed of assignment to John S. Chadwick. The assets are estimated at $5,000 and the liabilities, $8,718.49. The cause for the suspension was given as lack of capital.

The Bessemer and Lake Erie railroad, whose shops at Greenville, Pa., were recently damaged by fire, has built a temporary round house there, but has not yet decided upon plans for a permanent structure.

The Brown-Hurley Hardware Co., Des Moines, Ia., announces its change of name to the Brown-Camp Hardware Co., in accordance with the changes in the personnel of the company. Frank J. Camp is manager of the Brown-Camp Co.

At the annual stockholders' meeting of the Standard Boiler & Plate Iron Co., of Niles, O., the following directors were chosen for the ensuing year: W. A. Thomas, F. W. Stillwagon, W. A. Hutchings, S. H. Park, D. J. Finney and E. A. Gilbert, all of Niles, and G. A. Schaffner, of Niles.

The directors of the company then elected the following officers: E. A. Gilbert, president and manager; F. W. Stillwagon, vice president; D. J. Finney, secretary and treasurer.

The American Tube Bending Co., a recently incorporated concern of New Haven, Conn., proposes to make a specialty of manifolds for gasoline engines so largely used in the automobile industry. The manifolds will be made from copper, brass and steel tubing bent into proper shape.

The Thomson Drop Forge Co., Plantsville, Conn., advises respecting a recent fire which destroyed its engine and boiler room and part of the machine shop, that the forging department was not damaged by the fire, and will be running this week. The loss was found to amount to about $3,000.

Walter A. Edmonds, manager of the Eagle Iron Works, Norfolk, Va., foundry and machine shops, advises that while he had the matter of locating a plant at Big Stone Gap, Va., under consideration, he announces that it is altogether unlikely that he will be identified with the location of a plant at that point.

Contracts for 76 additional ornamental cast iron lamp posts on Broadway and North Broadway, Seattle, have been let by the city to the Olympic Foundry Co., Seattle. Chas. F. McDonald & Co., Seattle, were awarded the contract for the conduit work in connection with the new posts. The total sum of the two contracts is $17,618.

The Jemison Coal, Iron & Steel Co., Birmingham, Ala., whose incorporation with an authorized capital stock of $125,000 was noted recently, has these officers: President and treasurer, Alan L. Jemison; vice president, J. H. Brazeal; secretary H. S. Haztel. The company is authorized to build and operate furnaces and rolling mills, as well as coal mines.

The American Malleables Co., Lancaster, N. Y., whose incorporation was recently noted, advises that it has no particular plans aside from doing a regular malleable castings business. It has a capacity for handling 1,000 tons per month, chiefly gear work, making a specialty of railroad work, although it handles and makes all kinds of malleable iron castings.

The Falls Machine Co., Sheboygan Falls, Wis., manufacturer of woodworking machinery and specialties, advises that it has increased its capital stock to $150,000 for the purpose of buying additional equipment to use in the manufacture of motors. It will not put up any new buildings, its present plant being of ample size, but it will need some new machinery.

The Manistee Iron Works Co., Manistee, Mich., has made arrangements to manufacture a new pattern of water tube boilers for stationary plants. The boiler is known as the Butman. The company is converting the old machine shop into a boiler shop, having removed all the lathes and drills to the new shop and installing in place a set of 36-ton rolls for bending heavy boiler plate.

The Moline Pressed Steel Co., East Moline, Ill., has been incorporated by Fred A. Lindahl and others with a capital stock of $25,000, for the purpose of manufacturing pressed steel and sheet metal parts. It has purchased two acres near the foundry of Root & Van Dervoort. Plans are being drawn by W. H. Whitsitt, of Moline, for a building, which will be one story, brick, with saw-tooth roof.

Leonard Joseph, president of the Phoenix Iron & Steel Co., of New Orleans, has announced the decision to make Galveston instead of New Orleans the main exporting point for scrap iron which it handles in the south. The Phoenix company has leased 21,000 square feet of space from the Galveston Wharf Co., and at the same time has secured an option on a plot of ground adjoining.

The plant of the Shelbyville Machinery Co., Shelbyville, Ill., was sold at auction a short time ago, being bid in by the Citizens National Bank for $8,424.95. A second mortgage for $10,000 on the plant, held by Charles V. Coffeen, sold for $100, being bid in by M. B. Coffeen, who also bid $2,700 on unencumbered property, including raw material. The Shelbyville concern was removed to Shelbyville about four years ago from Chicago.

Its officers are: President, M. D. Coffeen; treasurer, Harry J. Smith, and general manager, C. V. Coffeen. It is understood that M. B. Coffeen and Harry J. Smith will have charge of the management of the shops.

The Michigan Copper & Brass Co., Detroit, advises respecting the recently noted increase of its capital, that it does not contemplate at the present time any additional plant construction. It has let contracts and is now installing additional machinery which will be ready for running within the next six weeks. These additions, together with operating the plant 24 hours a day, will bring up its output to its fullest capacity.

The share of the late William Kershaw in the City Machine Co., Cleveland, has been purchased by E. J. Kershaw, senior partner in the firm, who will continue the business as in the past, paying special attention to automobile work in its jobbing department, and building and erecting new machinery in its manufacturing department. William Kershaw, whose death made this change necessary, was killed in an automobile accident.

A protective committee has been organized by the holders of the 6 per cent sinking fund bonds of the Central Foundry Co., which went into the hands of a receiver last week. This committee includes J. N. Wallace, president of the Central Trust Co., of New York; C. D. Smithers, P. J. Goodhart and August Heckscher. The committee is preparing an agreement which will name the Central Trust Co., of New York, as depository.

At the annual meeting of the King-Lawson Car Co., Middletown, Pa., the following directors were elected: President, Thomas Lawson, C. O. Drake, Edward Bailey, Harold C. Hanson, Paul A. Kunkel, Arthur King and Howard W. Bible. The board organized by electing the following officers: President and general manager, Thomas Lawson; vice president, Howard W. Bible; treasurer, Harold C. Hansen, and secretary, Paul A. Kunkel.

John Mohr & Sons, Chicago, are engaged in the rebuilding of Ensley No. 1 blast furnace, at Ensley, Ala., which includes a new shell, downcomer and ore skip, but does not include new stoves. The same firm is rebuilding No. 5 furnace, at the South Works of the Illinois Steel Co. This furnace is being rebuilt on lines of the latest design, the shell having a much thinner lining than the old type, and being water-cooled from top to bottom. The newer design is somewhat on the same lines as are followed in German furnace practice. Another furnace contract on which the Mohr plant is engaged, is the repairing of the Northwestern Iron Co.'s furnace at Mayville, Wis. Besides the repairs to the furnace, three new stoves are building, and a new steel chimney for the stoves, which is to be 80 inches in diameter and 180 feet high.

Stockholders of the Bucyrus Steel Casting Co., Bucyrus, O., heard reports read at the recent annual meeting, showing that an excellent volume of business was transacted during the year, and that enough orders have already been booked to keep the plant busy for many months. These directors were re-elected: P. J. Carroll, George Donnenwirth, A. M. Rumer, Jacob Colter, Frank P. Donnenwirth, Dr. John A. Shesnay and W. A. Block.

The Joseph Goldberger Iron Co., Cincinnati, recently organized by electing these officers and directors: President and general manager, Joseph Goldberger; vice president, John Brashears; secretary, S. P. Butterfield; treasurer, William Bodener; executive committee: H. W. Morganthaler, F. H. Kirchner and John Brashears. The company, which is capitalized at $100,000, has taken over the old Front street pumping station, where it will handle scrap.

The plant of P. P. Mast & Co., Springfield, O., has been sold, exclusive of the real estate. An order has been entered by the federal court at Cincinnati, accepting the bid offered by the American Seeding Co., at $170,000, which does not include the real estate holdings of the Mast company. Receiver Foos has been authorized to accept the bid and to offer the real estate at private sale within 60 days at a price not less than $35,000. The other property is to be turned over at once to the American Seeding Co.

At the annual meeting of the J. A. Fay & Egan Co., Cincinnati, the annual report of President Thomas P. Egan was presented, showing that the company had enjoyed a good year, earning the dividends and a substantial surplus. These directors and officers were elected: President, Thomas P. Egan; vice president and general manager, S. P. Egan; second vice president, Frederic P. Egan; secretary, W. H. Green; treasurer, A. A. Faver; Rudolph Kleybolte, Joseph Rawson, John E. Bruce, Clifford P. Egan and L. G. Robinson, directors.

The John B. Morris Machine Tool Co., Cincinnati, whose incorporation was recently noted, advises that it was incorporated under Ohio laws with a capital stock of $125,000, and has purchased the machine tool business formerly conducted by the John B. Morris Foundry Co. Plans are being prepared for a new factory building, including over 30,000 square feet of floor space, to be employed in the manufacture of machine tools formerly made by the John B. Morris Machine & Foundry Co. Additional equipment will be installed, and the company expects to increase its line of manufacture.

Trade Notes:—

W. M. Barth, formerly manager for Cal Hirsch & Sons I. & R. Co., Chicago office, has engaged in business for himself in Peoria, Ill., with office in the Woolner building, and a large railroad yard in East Peoria.

The Moyer tram rail department of J. W. Paxson Co., Philadelphia, has closed contracts for the Moyer tram rail for the entire plant of the McNab & Harlan Mfg. Co., Paterson, N. J.; E. E. Brown & Co.'s new sash weight foundry, of Philadelphia; the National Car Wheel Co., of Pittsburg, and for the new plant of this company at Cleveland, O.

Fires:—

Damage to the amount of $200 was done to the building of the Kappler-Fox Foundry Co., Philadelphia, Feb. 18.

Fire starting in the blacksmithing department of the Hoefer Mfg. Co., Freeport, Ill., caused damage estimated at $12,000 Feb. 17.

The Colorado Fuel & Iron Co., suffered damage estimated at $60,000 to its pattern storehouse at the Minnequa plant Feb. 22.

The gasoline engine shops of Gade Bros., Iowa Falls, Ia., were damaged Feb. 17, the loss being estimated at $20,000 partly covered by insurance.

The foundry and shops of the C. T. Wright Engine Co., Greenville, Mich., were damaged Feb. 9 to an estimated figure of $4,500.

The Gray Iron Foundry Co., 319 West Michigan street, Chicago, was damaged to the estimated amount of $4,000 on Feb. 22. The same fire damaged the brass finishing plant of May & Johnson $6,500.

The three-story building occupied by the Voelkner & Harry Mfg. Co., Detroit, manufacturing hardware specialties, plumbing supplies, etc., was badly damaged Feb. 18. The loss is estimated at $60,000 with small insurance.

THE IRON TRA

LAKE SUPERIOR IRON ORE SHIPMENTS (Gros

[March 3, 1910.]

NAME OF MINE.	1909	1908	Prior to 1893	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	TOTALS.
Mesabi Range																			
Adams	1,829,372	765,592				59,141	234,562	170,738	390,860	720,474	777,346	829,118	1,242,923	1,109,750	940,105	1,140,984	1,238,350	1,136,513	12,585,828
Adriatic	107,317	108,129															3,294	70,187	288,927
Agnew	151,536	164,486											45,582	108,847	96,435	44,651	163,260	149,084	923,881
Ajax (Kanawha)										14,963	64,218	41,300	24,829	28,932	912	28,439	9,057		207,650
Albany	368,057	64,860												109,608	153,433	241,186	356,371	437,521	1,731,036
Alberta		51,143																31,032	82,175
Alexander		35,747																120,332	231,099
Auburn					108,210	376,970	131,478	175,263	235,630	385,992	263,692	427,510	38,283			15,073	60,547		2,143,028
Bessemer	227,767	120,350													86,303	112,630	131,791	78,012	756,853
Biwabik	542,821	365,781		151,500	90,048	247,069	242,565	427,464	383,180	553,836	924,868	410,074	623,127	807,511	647,614	1,092,987	807,374	803,750	9,121,569
Bray	65 514																		65,514
Brunt	14,212	636															75,401	178,935	269,184
Burt	1,660,101	1,460,998														1,860,452	1,376,875	1,501,272	7,859,698
Canisteo	85,505	2,760																5,454	93,719
Canton				24,416	213,853	359,020	16,261			99,498									713,048
Cass																			241,343
Chisholm	314,597	228,386										34,573	200,629	168,831	130,732	231,296	379,156	258,795	1,946,993
Cincinnati	4,537	4,790		26,372		17,187	57,324	32,912		246						965	1,373	6,369	154,075
Clark	484,512	334,594									63,071	199,566	350,799	300,492	256,873	358,091	274,394	319,983	2,942,375
Columbia												15,627				1,360			16,987
Commodore	409,148	116,069		65,137	7,213		22,063	60,798	80,494	152,947	278,416	35,546	65,833	20,436	249	146,901	263,401	477,203	2,201,804
Corsica	135,366	77,674										26,838	59,292	34,043	30,131		100 606	172,220	636,176
Crosby	183,470	152,084															115,373	227,265	678,192
Croxton	159,038	154,868																	
Cyprus	107,685	115,745											18,594	100,297	348	130,228	162,533	349,853	1,075,759
Day														121,818	244,343	235,351	192.144	260,948	1,278,034
Diamond									18,651	1,975			106,516	107,781	84,530				319,453
Duluth	150,501	149,185		37,626														171	471
Elba	224,202	147,916							112,155	165,435	128,587	150,024	150,220	150,053	149,819	142,172	158,336	93,120	1,737,233
Euclid	82,627								564	9,547	121,707	224,630	207,454	93,616	123,425	125,724	255,580	134,488	1,668,803
Fayal	1,879,357	1,439,879																	82,627
Forest	6,304	2,420				136,601	248,645	642,939	575,933	1,072,257	1,252,504	1,656,973	1,919,172	1,460,601	975,102	1,358,922	1,634,853	1,878,812	18,132,550
Fowler	99,892	21,511													85,280	99,785	41,647	4,840	240,276
Franklin	51,393	8,246		46,617	223,399	286,423	231,086	30,128	200,400	60,000	168,524	39,299	111,085	92,019	65,528		66,935	34,014	155,417
Frants															62,884	70,210	11,068	30,926	1,712,008
Genoa																		907	146,069
Gilbert	783,683	336,927					17,136	309,514	279,677	276,559	253,651	332,022	399,719	303,700	244,150	281,081	179,468	108,610	2,985,287
Glen	396,591	272,142																100,178	1,220,788
Grant													23,875	171,705	280,412	287,835	279,424	205,426	1,917,410
Hanna	238,873												51,946	18,928	44,413	49,227			164,514
Hartley		55,462																	238,873
Hawkins	316,783	248,246																354,646	390,108
Hector (Hale)	30,726			3,616	24,167	31,004	70,006	13,728		18,807	32,901	30,929	5,892	107,905	99,055	202,070	294,588	270,984	1,046,923
Higgins No. 2	322,504												54,289			4,996	37,221	65,952	418,336
Hobart															35,286	238,598	341,319	173,439	1,111,146
Holland																	975	7,339	8,314
Holman	391,157	1,682														158,484	95,472	16,908	270,864
Hull		163,020																8,068	400,907
Hull-Rust	3,039,911	2,926,683														233,065	282,592	157,365	830,043
Iroquois	152,510	151,071															1,690,311	2,900,493	10,557,398
Jennings	10,477	18,313												17,562	50,215	61,109	190,971	254,329	877,767
Jordan	12,754	118,529															84,715	99,812	215,317
Kellogg	165.458	31,331											147,931	190,024	97,474	185,854	110,768	61,996	925,330
Kinney	287,421	176,510																	196,789
Knox	7,464													32,352	6,225	89,161	57,691	145,989	793,349
La Belle	27,216	51,638											70,753	48,298	89,554	78,597	50,466	56,146	7,464
Lake Sup. Group						58,123	67,659	259,912	135,404	154,326	284,023	594,761	766,311	1,226,066	1,415,884				472,068
Larkin (Tesora)	46,651	14,030															12,001	22,040	4,962,469
La Rue	365,543	79,313												53,335	105,170	197,192	175,670	301,522	94,722
Laura	178.110	176,725											16,453	79,286	3,778	27,207	138,001	149,410	1,277,745
Leetonia	553,162	289,490											28,784	200,163	228,536	352,004	308,989	301,368	768,970
Leonard	6,857													10,591	151,952	297,011	254,368	137,316	2,262,496
Lincoln	303,066	379,219											87,908	279,399	153,822	275,777	367,192	297,870	858,095
Longyear													22,788	81,604	221	16,778			2,144,253
McKinley	89,981	1,399																17,705	121,391
Mahoning	1,561,893	611,592				117,884	167,245	519,892	520,751	750,341	911,021	765,872	1,038,645	1,009,446	706,325	1,011,661	1,274,232	1,564,336	109,026
Malta	92,356	93,072								28,615	65,346	126,299	222,640	11,675	66,641	139,853	115,763	82,062	12,531,132
Mariska	77,690	30,226																137	1,044,326
Mayas																			168,053
Miller	277,119	224,321															107,244	113,521	220,765
Minnewas		525		13,858	2,140											118,520	234,071	279,453	1,133,484
Minorca	119,154	80,330																	16,523
Mohawk	216.291	119,439											35,499	115,886	121,739	117,653	155,541	154,661	900,463
Monica	7,614																92,715	128,870	557,315
Monroe	147,521																		7,614
Morris	1,831,187	528,154														13,730	310 839	156,809	628,899
Morrow		1,571														1,070,937	1,809,743	2,076,388	7,316,409
Mtn. Iron (Aetna)		206,698	4,254	121.463	573,440	371,274	159,744	773,538	650,955	1,137,970	1,001,324	1,058,160	1,617,772	1,348,714	1,168,855	2,495,089	2,563.111	1,973,519	279,296
Myers	193,698	150,249														188,668	228,451	153,770	17,198,871
Nassau	11,940																	19,172	914,736
Onandaga	59,389	30,887																521	31,112
Pearce																			90,797
Pearson	68,683												54,884	50.204	235		65,862	71,645	242,830
Penobscot																			68,683
Perkins	59,029								11,933	29,652	85,619	146,641	221,080	209,531	1,615				706,071
Pettit	83,548	57,140																	59,029
Pillsbury		59,889																	496,830
Roberts									99,691	106,487	101,032	120,723	238,122	229,133	27,088	140,239	82,757	36,074	1,040,265
Rust		227,079							18,614	57,847	41,965	42,756	28,972			161,924	33,546	489,718	180,154
Sauntry-Alpena																			997,065
Scranton										53,004	68,560	328,739	249,837			272,114	284,517	213.355	700,140
Sellers	626,169	354.780																	1,068
Seville	23,585					47,433	153,037		112,765	174,867	56,280	34,918	193,428	251,631	1,168 207,990	261,501	241,031	155,060	12,870,890
Sharon																			23,585
Shenango	831,099	461,887										56,810	224,526	48,199					822,535
Silver	256,073	49,291													51,712	218,097	383,717	387,093	2,328,605
Sparta																			305,364
Spring		20,516						66,722	226,156	287,143		156,426	227,444	40,458	59,692	27,777	235		1,244,197
Spruce (Cloquet)	579,903	430,633			5.628	47,700	96,280	12,215		1,621	202,144	279,515	543,203	587,153	589,319	606,295	674,602	15,257	33,773
St. Clair											101,675			6,148	26,748	61,792		610,457	5,166,199
St. Paul																	24,230	113,200	94,688
Stephens														87,055		367,764			137,430
Stevenson	1.030,742	516,770										666,273	1,434,681	1,014,582	1,652,021	1,428,614	1,041,500	1,142,977	454,819
Susquehanna	243,049	182,352									56,031						20.954	137,207	9,981.191
Sweeney		7,579																	583,592
Syracuse	5,509																		7,579
Tener	256,384	174,033																	5,509
Troy	86,520	40,283												15,099	12,759	58,136	174,309	190,903	853,765
Union		20,937												91,496		87,584	146.849	100,730	489,824
Utica	201.480	57,194									8,297	93,109	103,522				20,691	51,825	399,877
Victoria	113 305	21,310											9,009	156,180	120,697	185,944	268,281	304,864	1,303,649
Virginia (Group)	1,843,450	661,329		125,015	544,954	622,712	955,739	749,499	560,848	293,651	417,473	5,420	5,131	5,866	5,395	402,224	64,820	90,090	289,525
Wacoutah	60,966																5,674	1,015,717	8,218,097
Webb		19,610															6,766	155,692	226,424
Williams (N. Cin'ti)						3,046	11,249			12,357	18,238					71,235	165,604	113,334	369,783
Wills	3,440												12,158				17,689	35,267	97,842
Winnifred (Day)	84,614	61,341												39,179	81,686	4,550	3,415	94,867	20,148
Yates	5 362	86,308													53,179	58,174	265,289	210,726	365,102
Yawkey	45,790	84 446																15,453	679,038
Total	28,176,281	17,257 350	4,254	613,620	1793,052	2,781,587	2,882,079	4,275,809	4,613,766	6,626,384	7,809,535	9,004,890	13,342,840	12,892,542	12,156,008	20,158,699	23,819,029	27,495,708	145,989
Gogebic Range.																			135,703,424
Anvil	22,927	35,937	169,604		13,297	68,064	57,483		5,037			1,101	135,502	11,309	45,595	82,118	79,493	39,495	766,962
Ashland	259 612	259.611	1,623,429	66,067	83,020	126,096	91,149	111,625	123,208	154,615	232,961	286,399	301,824	274,138	344,102	409,131	341,841	298,056	5,386,884
Atlantic	124.845	41,465	1,369			70,989	60,727	50,307	38,058	19,964	135,955	190,135	190,213	148,385	77,224	208,039	97,689	91,759	1,547,123
Brotherton	103 090	96,776	882,400	18,905	47,148	40,567	50,490	46,186	73,198	78,858	89,804	103,109	53,255	94,986	84,870	137,351	147,281	104,224	1,752,498
Cary (and Superior)	224 251	96,358	700,201	81,052	47,156	63,787	66,975	37,693	43,162	62,524	125,984	180,215	136,895	89,221	61,860	146,414	216,992	209,407	2,540,147
Castile	26,982																2,108	6,157	35,247
Chicago								504			633		44,625	22,965					68,727
Colby	170,095	58.305	1,296.612	59,346	32,616		48,492	22,921	152,875	103,239	32,572	23,475	22,526	54,915	81,141	83,736	113,001	94,480	2,450,347
Davis (Wisconsin)			23,251	15,210		10,253				5,029	3,569		31,530	734	11,225	3,160			103,961
Eureka	115,662	122,324	43,356	31,385	18,329	26,105	4,544										37,525	57,904	462,134
Geneva														7,108					7.108
Harm'y (Germania)	152		322,769	7,964				1,015		1,255	986	10,358	20,502	2,246	23,364	2,973	9,436	19,319	422.239
Hennepin			184,928								7,728	21,475	36,383	862		2,589	5,768		259,733
Iron Belt	44.560	2,508	355,060	23,976	45,109	148,228	81,351	96,763	58,418	105,934	54,664	43,883	79,121	25,353			3,227	17,347	1,185,502
Ironton	277,594	92,932	58,368							7,977	25,047		8,555	16,875	23,197	41,314	106,158	190,968	848,985
Jack Pot			3,944	1,651				1,265			33,893	19,988	102	31,709	6,538				99,090
Meteor (Comet)			67,805	9,604	11,782					332	7,844	34,140	19,117	6,156	59,587				216 367
Mikado	99,195	86,617				4,788		11,397		10,324	1,090	91,846	98,834	108,709	25,611	140,740	154,043	163,891	997 085
Montreal	191,611	177,006	490,128	34,299	46,037	138,882	131,531	191,106	270,776	153,307	107,524	72,945	136,354	93,139	163,021	107,854	139,202	159,763	2.804 485
Newport	1,008,354	579,390	545,032	109,718	150,392	157,821	142,369	150,979	196,953	263,711	217,201	190,448	141,671	279,905	171,931	138,023	549,745	551,496	5.845.039
Norrie Group	977 054	773,243	6,004.254	755,600	1030,834	1,204,323	585,221	990,899	1,057,957	1,148,907	1,098,742	1,083,398	1,483,013	1,145,711	831,558	1,527,128	1,245,997	1,109,085	24,052 924
Ottawa (Odanah)	100,223	33.893	70,731	3,956	2,437								26,141	87,929	30,420	21,986	57,219	46,424	481.359
Palms			231,597	2,658	37,911	46,965	114,108	207,153	176,925	154,705	139,658	7,603	82,113	60,800	53,718	13,953	5,622		1,284,489
Pike	22,174	6,303									3,434	6,346	6,343	115		11,161	17,934	24,922	98,732
Puritan (Ruby)			86,625									21,788			1,259				109 572
Shores							12.196	16,102	15,691	11,819									55 808
Sunday Lake	93 712	111,130	157,463	22,876	34,323	20,970	89,441	45,815		12,526	74,097	89,997	144,630	91,383	50,625	79,209	86,879	101,899	1.306.975
Tilden	154,506	111,184	261,771	135,118	209,077	418,188	250,205	276,890	287,203	500,830	481,909	446,670	468,672	211.534	204,581	188,104	169,697	312.496	5,088.635
Upson													11,065	310					11.375
Yale (West Colby)	71,458	14,874										12,836	26,043	46,211	46,860	60,224	56,657	38.010	373,173
Miscellaneous			142,543			1,950	13 185	120											157,798
Total	4,088,057	2,699 856	13,228,040	1329,385	1809,468	2,547,976	1,799,971	2,258,236	2,498,461	2,795,856	2,875,295	2,938,155	3,654,929	2,912,708	2,398,287	3,705,207	3,643,514	3,637.102	60,820,503
Miscellaneous — (In Wisconsin)																			
Illinois		51,108													47,922	71,413	67,118	72.180	309,741
Iron Ridge	15,955													17,913	19.558	39,978	61,624	3.966	158,994
Mayville	66,804	71,341	9,044	7,925	10,511	16,472	13,144	10,546	18,151	19,731	20.986	22,400	23,338	18,836	26,562	20,610	15.847	19,644	411,892
Total	82,759	122 449	9,044	7,925	10,511	16,472	13,144	10,546	18,151	19,731	20,986	22,400	23,338	36,749	94 042	132,001	144,589	95.790	880,627

RADE REVIEW

(Gross Tons) FOR 1909 AND PREVIOUS YEARS.

[Vol. XLVI, No. 9.]

NAME OF MINE.	1909	1908	Prior to 1893	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	TOTALS
Menominee Range.																			
Alpha														1,870					1,870
Antoine						27,931	110,821	98,847	104,510	93,025	119,940	63,429	110,993	107,886	81,164	138,395	195,855	100,996	1,353,791
Aragon	246,984	226,354	313,133	127,901	138,209	183,296	95,809	149,594	295,821	337,807	404,645	477,212	646,203	522,035	374,944	423,698	431,000	441,636	5,530,291
Armenia			76,924			2,045						18,750	100,864	31,901	16,577		27,882	36,665	311,598
Baker	45,003																		45,003
Baltic	174,426	129,037										17,326	64,664	123,236	151,114	133,246	186,496	189,119	1,168,863
Berkshire	34,295	3,440																	37,735
Breen			17,430													16,625	21,004	20,366	75,425
Bristol (Claire)	396 825	190,300	57,352	9,612						80,915	51,639	36,593	129,035	246,581	132,420	210,388	298,031	345,676	2,185,367
Calumet		15.222	38,713														15,773	51,646	121,354
Caspian	189 023	102,628												2,088	4,242	10,248	80,875	138,867	527,971
Chapin(Ludington)	587,647	391,620	5,368,399	489,243	236,249	618,589	420,318	643,402	724,768	940,513	929,937	929,701	956,812	704,051	541,324	902,628	943,425	855,308	17,185,354
Chatham	68,730	45 826																14,883	129,439
Clifford	103,626																		103,626
Columbia			254,821	22,426	10,300	70,967	87,202	24,623	14,199	126,290	97,531	19,963	186,798			27,883			942,703
Commonwealth	50,787		1,100,989	151,291	174,921	208,880	93,707	98,283	250,687	117,295	53,342	77,799	112,704	5,051	1,617	8,085	6,346		2,511,784
Crystal Falls	986	296	5,315			13,037	44,526	95,210	128,233	147,346	197,770	230,614	195,555	117,096	180,983	152,255	111,871	114,188	1,736,251
Cuff										20,210	38,209								58,419
Cundy (Quinnesec)	5,512	1,410	283,323				3,395	41,942	76,877	111,952	167,115	245,183	245,583	161,559	33				1,344,545
Dober (Riverton)	171,200	47,073	904,587						5,009	13,242	120,207	119,860	215,850	97,633	81,543	82,611	161,704	90,358	2,110,877
Dunn	193,396	8,829	747,951	58,590	24,538	90,885	47,081	31,062	49,381	7,458			2,816	5,365		21,051	91,476	141,992	1,541,971
Eleanor (Ap'l'ton)			4,377	5,618		2,107										1,819	3,121	1,677	18,719
Fairbanks (P't R.)			230,871								1,316		10,383	9,863	11,257	11,973	28,324	75,805	379,789
Florence	231.191	140.354	1,057,116	9,634	2,726	22,820	35,136	37,594	93,663	74,235	35,756	15,395	130,798	95,877	153,452	233,858	169,450	178,955	2,778,019
Fogarty	77,356	32,560																7,949	117,865
Forest															11,988				11,988
Genesee (Ethel)	65,585												14,455	61,694	132,380	77,370	80 971	38,984	471,439
Gibson	36,246	4,548	16,357																57,151
Great Western	112.747	124,246	374,439	661			14,643		33,851	43,316	98,550	123,261	42,470	100,751	68,318	191,265	311,218	234,492	1,872,228
Groveland	24 933	9,123	1,049									11,444	7,599	1,294	4,737			13,913	74,102
Hemlock	112.481	83,834	100,990	11,323		949	94,645	96,032	69,865	110,269	72,413	149,966	123,331	79,420	136,232	124,450	106,437	117,181	1,589,818
Hiawatha	136,739	138,190		1,683		1,201					11,008	20,355	74,596	53,828	38,288	9,704	20		485,012
Hilltop										3,496	6,410	2,503					7,820		20,229
Hollister	25,842	10,671	4,098															6,371	46,982
Hope			15,543	2,275									3,373	7,339					28,530
James	90,851	59,760																2,360	152,971
Keel Ridge			65,462	3,298		19,441				4,900									93,101
Kimball																		16,224	16,224
Lamont (Monitor)			112,532	13,777	2,600					67,652	31,323		47,267	43,736	29,393	74,991	89,980	42,080	555,241
Lincoln	1,657		27,832	8,757						43,622	72,959	19,727	7,747	15,606	17,577	19,539	5,890	714	241,627
Loretto	96,613	13,354		8,131	55,983	53,160	34,334	54,104	68,447	64,824	61,219	54,985	128,300	87,939	64,720	118,738	140,390	99,779	1,196,029
Mansfield	118.713	44 633	137,398	69,558				37,182	60,739	86,607	90,155	74,113	31,181	51,440	79,163	38,584		183,532	1,102,998
McDonald	1,144																		1,144
Michigan		603		505	77	1,071		216					53,272			58,088	146	39,819	153,797
Millie (Hewitt)	10,887	3,322	115,901		13,062	10,924	21,815	10,374	17,430	15,194	14,922	12,133	25,935	40,860			36,815	18,691	308,267
Monongahela												2,397		6,913					9,310
Munro	23,241	27,773												8,739	32,332	92,183	47,454	46,884	278,506
Nanaimo		305	127,566												9,086	91,238	91,792	53,778	373,765
Northwestern			17,206										1,324	17,280					35,810
Penn Iron M'ng Co.	428.004	176,211	3,663,027	280,450	175,274	290,622	179,917	237,886	223,713	229,651	197,606	358,126	273,443	343,543	141,948	423,244	496,562	381,128	8,500,375
Pewabic	465,453	365,341	225,860	165,745	304,010	262,551	273,587	279,855	305,072	530,129	374,043	507,786	530,291	489,175	372,791	583,413	493,891	457,796	6,500,189
Quinnesec	3.147																		3,147
Saginaw (Perkins)	19,994	38,669	395,064			2,161											21,017	26,080	502,985
Sheridan			54,579	2,234		16,754	3,419	146		31,104	8,063								116,299
Tobin	359,668	161,642										18,957	55,238	45,386	113,669	166,529	235,867	237,781	1,394,737
Verona											5,143	11,475	43,245	50,910	20,202				130,975
Vivian		10,056											40,384	12,122	81,354	90,426	122,577	48,493	405,412
Youngs	154,150	70,094														10,926	47,583	92 632	375,385
Zimmerman	10,303	1,832																	12,135
Miscellaneous			1.009,302	23,485		23,746	112	661											1,057,306
Total	4,875,385	2,679,156	16,923,306	1466.197	1137,949	1,923,798	1,560,467	1,937,013	2,522,265	3,301,052	3,261,221	3,619,053	4,612,509	3,749,567	3,074,848	4,495.451	5,109,088	4,964,728	71,313,115
Marquette Range.																			
American(Sterling	90.001	23,222	112,933														419	13,764	240,339
Austin	125.858	111,229																195,950	433,037
Beaufort (Ohio)	72,987	61,035	90,217								1,583	4,338	59,781	134,648	25,781	33,306		78,629	500,705
Bessie			847										5,007	29,718		21,879	1,646		59,097
BreitungHem. No.2	129,673	55,849												7,854	9,869		38,671	59,667	301,583
Cambria	136.815	85,977	665,430	30,445	47,218	41,656	95,086	110,648	102,623	124,930	80,432	68,907	63,976	41,168	84,852	81,791	40,628	135,145	2,057,727
Champion	11.199	313	2,764,506	61,648	42,788	100,398	113,375	141,728	163,190	215,074	113,743	99,026	205,721	74,238	174	64,680	115,007	107,577	4,394,385
Cleve'd-Cliffs Gr'p	877,433	438,379	7,714,684	348,917	797,466	480,195	513,119	718,408	869,482	1,011,048	881,021	860,484	1,104,864	810,845	743,263	1,288,416	1,330,944	1,030,928	21,449,896
East New York			165,332	911							27,987	31,696	38,761	22,523	7,299	33,095			327,604
Empire	108,993	53,537																40,566	203,096
Foxdale												4,647	15,015	5,053	3,429	3,303			31,447
Hartford	250,680	278,366	6,244	6,513	940		1,582						7,440	20,085	179,980	322,209	364,801	322,161	1,766,961
Imperial	115.478	48,231	64,206							23,235	62,321				727	1,661	5,076	56,755	376,691
Jackson	11,060		3,255,182	51,009	32,288	42,186	80,710	79,102	55,012	88,230	31,714	38,271	15,449	5,409		33,180	5,066	61,345	3,885,213
Lake Angeline	280,298	220,410	2,331,579	351,973	355,453	313,555	342,251	489,685	460,335	464,988	389,128	481,574	304,125	310,950	262,486	374,183	269,116	283,373	8,285,460
Lake Superior	349.435	261,955	5,718 007	329,610	344,758	342,439	459,576	376,761	686,563	682,595	709,143	635,642	832,796	604,829	590,339	727,378	635,671	674,066	14,961,563
Lillie	61,708	8,632	291,526	68,861	78,388	54,285	107,532	112,781	211,023	196,200	114,990	98,788	79,919	77,454	63,209	9,868	32,781	80,545	1,748,490
Lucy (McComber)	1.672	1,115	472,316	21,964				10,033	11,846								86		519,031
Maas	159,197	29,036																32,378	220,611
Magnetic(st'k pile)																	292		292
Mary Charlotte	240,433	99,104												94,903	48,885	221,738	257,088	155,633	1,057,184
Mitchell		11,539	17,780																29,319
Moore											4,648	37,655			25,828				68,131
Negaunee	312,217	232,219	355,433	69,732	132,581	90,682	175,394	182,169	191,330	195,573	126,829	234,713	204,286	224,666	145,132	239,554	253,448	296,170	3,662,127
New York (York)			1,066,615	25,000	21,487					6,642	3,327								1,123,071
Palmer							1,041										13,181		14,172
Portland	79 652																		79,652
Princeton (Sw'nz'y)	42.934	36,033	191,400	19,096		6,593			25,247	55,802	75,037	67,051	118,048	84,223	76,461	129,079	166,894	177,863	1,271,761
Queen (Blue)	237,509	104,098	1,535,651	120,673	252,469	204,957	323,057	242,293	61,022	342,978	398,298	400,845	418,044	254,658	311,479	253,377	221,096	309.917	5,962,421
Republic	176 575	67,999	3,905,087	64,195	105,719	174,027	127,360	124,342	140,312	137,085	130,126	104,604	157,646	155,415	124,506	150,699	177,220	170,564	6,196,471
Richmond	102,566	60,994					1,088	4,630	24,464	4,613	51,303	54,181	50,041	55,593	68,134	86,129	89,563	35,156	688,455
Rolling Mill	133,139	52,147	234,625					3,975			22,585	22,815	24,574	6,786		28,766		49,204	578,916
Star West (Wheat)			114,589		5,550	51,207	9,658	942		6,716	15,987								204,649
Stegmiller	39 869																		39,869
Stephenson	64,075	52,588																6,305	122,968
Volunteer			890,776	69,561	26,946	32,672	53,216	1,617		29,983	47,578		32,736	7,395	71,870	106,281	38,544	10,022	1,419,197
Washington	44,716	20,625																	65,341
Webster			14,108								20,797								34,905
Winthrop (Mqtte.)			576,183	180 071	134,365	119,120	150,496	106,894	122,592	171,318	148,945	109	129,496	72,433					1,912,022
Miscellaneous			5,336,962	15,714	81,814	43,866	49,730	9,027											5,537,143
Total	4.256,172	2,414,632	37,892,218	1835,893	2060,260	2,097,838	2,604,221	2,715,035	3,125,039	3,757,010	3,457,522	3,245,346	3,868,025	3,040,245	2,843,708	4,215,572	4,057,187	4,388,073	91,908,991
Vermillion Range.																			
Chandler		50,639	1,722,458	435,930	558,050	605,024	471,545	438,365	715,919	808,359	644,801	627,379	645,786	460,548	422,162	365,739	318,990	245,684	9,537,378
Pioneer	477.226	477,506	20,886			40,054	149,073	207,103	123,183	339,897	450,794	678,310	673,863	596,735	505,432	653,682	766,853	830,700	6,991,297
Savoy	83.167	82,521								81,022	170,446	212,908	243,937	169,616	74,866	91,775	106,933	43,320	1,359,611
Sibley	151,009	127,544								5,169	4,670		78,304	113,595	122,783	251,170	271,496	226,835	1,352,575
Soudan(Minnesota)	74,862	53,070	3,526,938	370,303	390,463	432,760	448,707	592,196	426,040	457,732	325,020	208,284	275,168	175,114	70,713	205,002	146,503	102,977	8,281,252
Zenith	321,951	50,264	14,991	14,388			18,765	40,817		79,323	60,089	60,082	167,206	161,091	86,557	109,818	181,580	235,751	1,602,672
Total	1,108,215	841,544	5,285,273	820,621	948,513	1,077,838	1,088,090	1,278,481	1,265,142	1,771,502	1,655,820	1,786,063	2,084,263	1,676,699	1,282,513	1,677,186	1,792,356	1,685,267	29,125,385
GRAND TOTAL	42,586,869	26,014,987	73,342,126	6073,641	7759,753	10,445,599	9,947,972	12,475,120	14,042,824	18,271,585	19,080,379	20,615,907	27,585,904	24,308,510	21,849,401	34,384,116	38.565,762	42,266 668	419,647,043

MINES NOT PRODUCING SINCE 1898.

MARQUETTE RANGE.

Ames	6,298
Bay State	16,637
Boston	62,542
Braastad (Mitchell)	136,736
Braastad (Winthrop)	831,445
Chicago	9,012
Columbia (Klomin)	94,813
Curry	16,671
Detroit	140,841
Dexter	118,512
Dey	2,709
East Champion	76,002
Edison	893
Erie	8,136
Etna	1,091
Fitch	31,817
Goodrich	49,754
Grand Rapids (Davis)	110,736
Hortense (North Champion)	30,574
Humboldt	723,961
Iron Mountain	393
Manganese	6,359
Michigamme	880,362
Milwaukee	375,432
Mesabi's Friend	16,043
National	150,216
Negaunee Con. Wks.	12,708
N. Republic	289
N. Y. Hematite	37,587
Northwest	1,687
Nonpareil (St. Law.)	23,395
Norwood	5,753
Ogden	986
Pascoe	59,806
Pendill	45,993
Phenix (Dalliba)	59,114
Pioneer	15,409
Platt	73,844
Primrose	6,040
Quartz	491
Republic Reduction Co.	47,174
Richard	8,261
Riverside	16,160
Saginaw	451,424
Samson (Argyle)	267,805
Schadt	1,261
Section 12	21,887
Spurr	164,244
Taylor	32,970
Titan	90,371
West Republic	133,077
Wetmore	50,870
Wheeling	10,552
Total	5,537,143

MENOMINEE RANGE.

Beta	4,211
Brier Hill	14,981
Cornell	49,302
Delphic	33,770
Emmett	66,585
Half and Half	7,524
Hamilton (Ore Co.)	96,072
Hersel	955
Indiana	17,871
Lee Peck (Cherry Valley Ore)	2,844
Manganate	6,844
Mastodon	425,708
Metropolitan	107,027
Perry	3,138
Selden	2,092
South Mastodon	8,203
Stephenson	39,350
Sturgeon River	19,404
Youngstown	151,423
Total	1,057,306

GOGEBIC RANGE.

Bessemer	20,889
Blue Jacket	1,799
Federal	36,443
First National	1,997
Iron Chief	12,199
Iron Chief No. 2	351
Pence	40,366
Sparta	4,862
Trimble	25,931
Tyler's Forks	10,683
Valley	1,879
Total	157,798